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THE

DISCOVERY

OF THE

VITAL PRINCIPLE,

OR,

PHYSIOLOGY OF MAN.

"If the human mind can ever flatter itself with having been successful in discovering the truth, it is when many facts, and these facts of different kinds, unite in producing the same result."

M. BAILLIE.

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PREFACE.

The Vital Principle—the source of all animal life, has engaged the attention, and been the subject of research, of scientific men of every age and country: speculation has been added to speculation, experiment to experiment, yet this "*philosopher's stone*" remains involved in its original obscurity. The human mind, weary of conjecture, and recoiling from fruitless labours, has at length assigned to the object in pursuit the character of some wild chimera —some *ignis fatuus*, calculated to mislead into a labyrinth of unprofitable study, or, if really existing, being, for some wise and unseen purpose, withheld from the understanding of Man.

The period, however, has arrived in which this truth must be developed! real knowledge always progresses with necessity, and the elucidation of the Vital Principle has now become essential to the wants of mankind: for, while we continue unacquainted with the origin of life, what effectual step can be taken to prevent the incursions of disease and death, so unusually prevalent in the present day? On the explanation of the vital phenomena, and general diffusion of physiological knowledge, will be found to depend the preservation of the entire human species.

The intention of the present work will be evident on the perusal of the following brief outline of its contents.

Animal life being divided into three distinct stages, and these proving analogous to the solid, fluid, and aeriform states of inorganic matter, all creation is here identified with the *animal origin*, and our universe, generally admitted to be in the

condition of an undulating fluid, maintained to be capable of assuming also the solid and gaseous forms of existence: from which the following deductions have been made:—

1st, That an Ovum was originally formed, containing within its circumference or boundary, all known matter in a solid, latent, and inactive condition. From this ovum has arisen,

2dly, The Fœtal, or fluid state of matter, which has been endowed with active life for the purposes of organization; the heart being our sun, the other heavenly bodies—the several organs belonging to the fœtus: the whole (our earth included) progressing at the present period towards the structure of one complete human frame, analogous to that of *Man.*

3dly, The future, or perfected existence of the present fœtus as a locomotive being of celestial substance and imperishable nature: this last period answering to the life of man subsequent to birth, which is the aeriform stage.

The subject of this volume may therefore be con-

sidered the *life of an individual:* the object—the primary object, for which it has been written, is the *prolongation* and *preservation* of the existence, not only of this individual, but of the whole human race: for in this individual all other life is included, ("in Him we live, and move, and have our being,"* our life being "hid with Christ in God."†)

Man, apparently supposing that the earth on which he moves will ever continue to exist in its present state, is daily forming new plans, and laying down projects extending to an eternity, which, as far as regards this universe, can exist only in his own imagination: at no time since the creation could such an opinion have been so dangerous! —at no time therefore could the discovery of the Vital Principle have proved of greater utility! To arrest the progress of undertakings which are calculated to bring to a *premature* termination

* Acts, xvii. 28. † Colossians, iii. 3.

the fœtal life of this universe, and consequently to involve a dissolution of the present state of organized matter in our own sphere, has been the aim and intention of the author in the ensuing volume: numberless have been the anxieties consequent upon the rapid progress of events connected with the subject it comprises,—and all engrossing the hope that, ere too late, Man might become acquainted with his impending danger! The promulgation of this discovery was a duty incumbent upon any person within whose reach a knowledge so important had been placed: this duty, this imperative duty, is now fulfilled, and the knowledge upon which will be found to depend the fate of past, present, and future ages, is at last placed within the limits of the comprehension of Man!

This work is addressed to the whole world, but to the scientific and medical branches of society more particularly, under the conviction that by their united efforts alone can the Discovery of

the Vital Principle be rendered to its full extent available to the community at large, and the object of the author ultimately accomplished. Should this be appreciated, another volume is in contemplation, in which it is proposed to give a more enlarged and comprehensive view of the primary and henceforward all-important subject—the Disease of Man.

London; July 16, 1838.

CONTENTS.

CHAP. I.

The Ovum of the Universe.

CHAP. II.

The Fœtus of the Universe.

CHAP. III.

Matter.

CHAP. VI.

Man.

CHAP. VII.

The Earth.

and its final overflow, or Deluge. Detachment of the planet from the bonds which confined it to the sun. It presents its apex to that body. Cause of the equal division of summer and winter at the North Pole. Earth's revolution on its axis and orbit. Its ascent to the point of heat, and return to its old situation. The seasons. Detachment of the moon from the earth. It presents its apex to the latter. It causes the flux and reflux of the tides. Inferior and superior lives opposed to each other. Sun's influence on the earth's surface. Colour and light. Progression of organization. Temperature of the earth and thermometer of life. South Pole, the point of radiation. North Pole, the point of attraction. Earth, an epitome of the universe. Its three divisions: answering to the sun, fluid medium, and boundary. The terrestrial line of gravitation. Its powers. Solidity of the earth's surface near the North Pole, contrasted with the fluidity of the Southern Hemisphere. The cause. Captain Cook's observations on the South Pole; Captain Ross on the North, and its phenomena. Increase in bulk of our planet. Atlantic and Pacific oceans caused by the retreat of the diluvial waters. Manner in which the earth becomes reorganized. Its boundary, the source of internal light. The heart, the source of animal heat. The descent of solar matter testified by observations of aeronauts, and mountain tops being covered with snow. Atmospherical phenomena; their causes. Formation of rocks. Cuvier's estimate of the distribution of matter on the earth's surface. All matter the produce of the diamond. Bakewell on primary rocks. They originated from animals crystallized by the deluge. Cause of fossil formations. Dr. Faraday on silicified trees and other fossil specimens. Present surface produced from the decay of the antediluvian. Rocks have to pass through the three stages. Deposited by aeriform matter. Chief base of rocks according to Ehrenburg is *iron*: they consist of infusoria in a fossil state. This formed the crystalline or oval stage. Mr. Crosse's experiments support this theory. Base of the present surface formed by infusoria. Rock changes to the fœtal stage. Fluid generated. New depositions. Each part has a line of gravitation. Powers of this line. Division of the solid rock into three forms of matter. Formation of seas. Colour of these fluids, occasioning the denominations *black*, *red*, and *white*. Land and sea animals. Progressive organization, and ultimate production of, man. Clefts in rocks. Atmosphere composed of living animals. Materials of which insects consist. They are produced by atmospheric combustion. Division of the membrane. Ascending and descending creation. Progress of matter like that of the butterfly. Shell deposited in each change to propagate the succeeding generation. Living and dead tissues. Eggs of three classes: their colours, black, red, and white. Earth formed by the decomposition of man's body. Granite rocks, and subsequent strata. Production of different coloured races from them. Progress of organization, limited: degeneracy and death succeed. Man formed on the base of the lower creation. Contains every living animal in his frame. Superior bodies formed by uniting the inferior. Inferior by *separation* of the superior. The earth's surface consists of every animal united. Life produced by combustion. Labour the lot of man, since the fall. The lower animals converted

CHAP. VIII.

The Fœtus of the Universe.

(Continued from page 61.)

3

CHAP. IX.

Man.

(Concluded.)

ERRATA.

Page 66, for *Mizain* read *Mizam*.
—— 118, — *Blande* read *Brande*.
—— 157, — *loose* read *lose*.
—— 159, — *contrivor* read *contriver*.
—— 182, — *on* liquid flame, read *of* liquid flame.
—— 183, — *accidity* read *fluidity*.
—— 190, 232, for *aeriforme* read *aeriform*.

THE

DISCOVERY OF THE VITAL PRINCIPLE,

&c.

CHAPTER I.

OVUM OF THE UNIVERSE.

"*A Seed shall serve Him, it shall be accounted to the Lord for a generation.*"—PSALM xxii. 30.

ANIMAL life is progressive, commencing with the smallest imperceptible atom, and passing through three successive stages, which may be termed the oval, the fœtal, and the locomotive, where it finally obtains a definite development and structure. The laws by which life is governed are universal and invariable; they have force not only over man, the most perfect specimen of animated existence, but over the brute creation, over plants, the heavenly bodies, and the vast universe in which all these are

contained.* The matter, which is generally considered inorganic, changes, like that of which organized bodies are composed, from solid to fluid, from fluid to aëriform; and the universe, as a whole, I maintain is to be regarded as endowed with that life, which its more perfect parts, (as, for instance, man, and the animals,) manifest: thus endowed, it is to be contemplated as of necessity passing through three stages of existence, identified with the several states of matter in the following table; the first of which is the *solid*, or oval; the second, the *fluid*, or fœtal; the third, the *aëriform*, or locomotive.

THE THREE ANALOGOUS STAGES.

	INORGANIC, OR MINERAL.	VEGETABLE.	ANIMAL.
1st Life, or oval.	Solid, (as Ice.)	*Seed.*	*Ovum.*
2d Life, or fœtal.	Fluid, (as Water.)	Embryo, or Seed sprouting in the ground.	Fœtus, (which is also termed embryo during the first period of gestation.)
3d Life, or locomotive.	Aëriform, (as Steam.)	Plant *above* ground.	Animal *born.*

Man has been created in the image of his Maker, and has been called the microcosm; in the uni-

* "Centuries ago, enquirers were admonished by Lord Bacon, that the nature of any thing was seldom to be found in the thing itself; and in illustration of this general truth, foretold that the laws of the heavenly bodies would be discovered, as they were afterwards discovered by Newton, not in the bodies themselves, but in the bodies upon the earth."—*Basil Montague's Essays.*

verse, as we now present it to his contemplation, he will behold his own frame revealed, on the largest and most complete scale; it has been justly called the macrocosm when compared to him. Plato says, "Forasmuch as of sensible and singular things there must of necessity be some exemplars, viz. ideas, of which are sciences and definitions, (for, besides all particular men, we conceive a man in our mind, and besides all particular horses, a horse, and likewise besides all living creatures, a *living creature, immortal and unbegotten:* as from one seal are made many prints, and of one man there may be many pictures, of all which the Idea itself is Cause that there are such as itself is,) it is necessary that this universe, the fairest fabric of God's making, be so made by God, that in the making thereof, he looked upon an idea as its exemplar, whilst by a wonderful providence and most excellent design, God applied himself to the building of this frame, *because he was good.* God, therefore, made it of all matter, which, being before the generation of heaven disorderly scattered, he from a deformed confusion reduced to beautiful order, and adorned every way the parts thereof with fit numbers and figures, until, at last, he so distinguished them as now they are."*

* "It was the opinion of Plotinus, confirmed not only by the best Platonists, but even by Aristotle, and all the Arabians, especially Avicenna, that God, from eternity, produced a creature of incor-

Lord Brougham, in his work on Natural Theology, says, "Upon the scheme of materialism, no rational, indeed no intelligible account can be given of a first cause, or of the creation or government of the universe."* I, however, confidently expect in this manner to show most rationally and most intelligibly, what this beginning of all things created was.† We are accustomed to behold the sun, that vast luminary, placed in the centre of our system, the planets revolving round him in their appointed orbits, the fixed stars, and all the other phenomena of heavenly bodies, in the order, harmony, and perfection, which they now present, and to imagine that they have existed in the same manner from the creation. "Has then all this

poreal and intellectual nature, as perfect as is possible for a created being; beyond which he produced nothing."—*Stanley.*

The belief of the Arians seems to have been founded on a similar basis: "Arianism, while it declares Christ to be a creature, believes him, nevertheless, to be a being of a superior nature, produced before the world, and the organ of the Creator in the production of other beings. Milton, Clarke, and Locke were Arians, Newton also according to report, and at one time Priestley."—*Cuvier.*

* Lord Brougham says, "How the Supreme Being made matter out of the void is not easily comprehended. This must be admitted; but is it more easy to conceive how the same Being, by His mere will, moved and fashioned the primordial atoms of an externally existing chaos, into the beauty of the natural world, or the regularity of the solar system?"

† "Dr. Clarke's first proposition that something must have existed from all eternity, is demonstrated by showing the absurdity of the supposition, that the things which now are were produced out of nothing."

immensity of matter, this universe of worlds, and system within system, been the result of *one single fiat* of the Creator? Or did He merely produce a vast central and aggregate chaos as the rude basis of future worlds, the parent stock, or storehouse, from which they have issued by distinct efforts and evolutions?" From the Scriptures we learn that God did not produce the whole of the vast machine of the universe by *one single effort of His power,* but that he was employed for the space of six days in the act of creation, forming the several parts contained therein in succession, after which He rested from His labours.

Life then in our universe has been progressive, and it is my object to trace it from its origin up to the present period, proving that there is what may be termed a scale of life, which comprises, in fact, all creation, and accounts for the development which we witness. In this investigation, taking an opposite plan from that usually adopted by astronomical writers, (whose observations are limited to the surface of matter in its present state,) I shall endeavour not only to arrive at some satisfactory conclusions respecting the past state and present condition of this vast fabric of the universe, but to determine its ultimate destiny.

The universe, endowed at the beginning with life, could only have attained its present state of

active existence, (the fluid,) by passing through the solid or oval period; and as solidity is the first essential to my idea of a seed, so must I attribute solidity to the first condition of the matter forming our universe.*

Sir Isaac Newton gives the following opinion on primitive matter. "All things considered, it seems probable, that *God, in the beginning,* formed matter in solid, massy, hard, impenetrable particles; of such sizes, figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them. And that these primitive particles, being *solid*, are incomparably *harder* than any *porous* body *compounded* of them: even so very hard *as never to wear and break in pieces;* no ordinary power being able to *divide* what God himself made *one* in the *first creation.*" Lucretius seems to have entertained in a much earlier period a similar opinion respecting the solidity of primitive matter, for the following passage occurs in his work on the "Nature of Things."

* "The solar system, at this its beginning, must have been arranged and put in motion by some cause. If we suppose this cause to operate by means of the configurations and the properties of previously existing matter, these configurations must have resulted from some still previous cause, these properties must have produced some previous effects. We are thus led to a condition still earlier than the assumed beginning, to an *origin of the original* state of the universe." —*Whewell.*

"What lives immortal, too, must so exist
Or from its own *solidity*, empower'd
Each blow to conquer, undivided still,
As primal atoms."*

The only notions we have it in our power to form respecting matter with any prospect of certainty, are from analyzing it at our planet the earth. Here we accordingly find one species alone answering the above description. The Diamond is, in my opinion, the identical primitive matter so correctly defined by the poet and philosopher I have just quoted. At first view it may appear a strange and bold assertion, but I expect to prove, beyond a possibility of doubt, that from this material the universe, containing such an immense number and variety of bodies, was really organized. According to Pliny, "the superior rigidity of the diamond renders it proof against almost every species of blow; insomuch, that if beaten on an anvil, the iron itself, both of the anvil and of the hammer, will yield before the diamond."†

Some of my readers may here exclaim, "Is it then to be supposed for a moment that this diamond, which possesses in so eminent a degree the

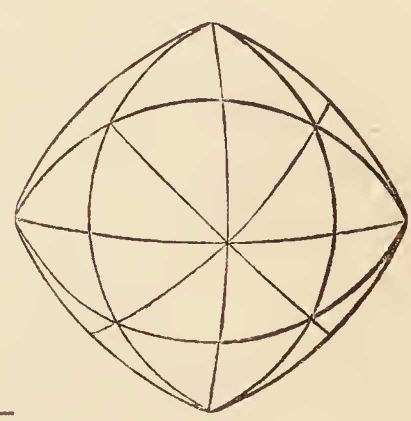
* "Epicurus believed that the elementary particles of matter were solid compact bodies."—*Mason Good.*

† "Newton sided with the idea of atoms, as they have always been termed, (from the primitive *α* and *τεμνω, I cut,*) being indivisible." —*Hiley.* This may be inferred from the above passage of Sir Isaac Newton, "no *ordinary* power being able to divide what God himself made *one* in the *first* creation."

essential quality of hardness, is that substance which fills all space, forms every figure contained in a circle, is seen and felt in every place, is visible and invisible, assumes every shape and colour, gives laws to all mankind, builds cities and palaces, and peoples kingdoms?"

Would any one, I ask in reply to this question, who is unacquainted with the powers of organization, suppose that from a single minute seed, could arise a full-formed plant in all its beauty and perfection; or, from the simple egg, an animal endowed with the powers of feeling and locomotion? Are these extraordinary facts more difficult for such a person to conceive, than for one already acquainted with them to believe, that, under certain circumstances, the phenomena I have enumerated might be achieved by the diamond?*

In its natural state this valuable gem is found in the figure described in the subjoined diagram, which has an oviform surface in whatever direction it is viewed. Jameson also describes three very magnificent samples, as follows:—



* Of the wonderful power of organization, Dr. Roget says, "Let us take as a specimen the crystalline lens, or hard central part of the eye of a cod-fish, which is a perfectly transparent, and to all appearance homogeneous spherule. No one, unaccustomed to explore the wonders of nature, would suspect that so simple a body, which he might suppose to be formed of a uniform material, cast in a mould, would disclose, when examined under a powerful microscope,

"One of the largest undoubted diamonds is that mentioned by Tavernier, formerly in the possession of the Great Mogul, and which traveller found it to weigh 279$\frac{9}{10}$ carats. It is the size of a hen's egg, of the same shape, and is cut in the rose form. Before cutting, it weighed 900 carats. It was found in the mine of Colore, to the east of Golconda, about the year 1550.

"A very large diamond is said to be in the possession of the Rajah of Mattan, in Borneo, in which island it was found about eighty years ago. It is egg-shaped, with an *indented hollow* near the smaller end. It is said to be of the purest water. It weighs 367 carats.

"The magnificent diamond on the top of the sceptre of the Emperor of Russia, deserves next to be noticed. It is perfectly pure; weighs 195 carats; and is the size of a pigeon's egg. It was one of the eyes of a Brahminical idol, and was stolen by a French grenadier, who disposed of it at a very low price; and, lastly, after passing through three other hands, it was offered for sale to the Empress Catherine of Russia, who purchased it for about £90,000 ready money, and an annuity of about £4,000 more."

and with the skill of a Brewster, the most refined and exquisite conformation. Yet this little spherical body, scarcely larger than a pea, is composed of upwards of five millions of fibres, which lock into one another by means of more than sixty-two thousand five hundred millions of teeth."

Every ovum is formed by a certain process, and until this process is perfected, it cannot enter upon the second or fœtal stage of animal existence. According to Dr. Roget, "the process itself by which the germs of living beings originate, is veiled in the most impenetrable mystery." This hitherto inexplicable enigma will, I trust, be elucidated by the manner in which primitive matter became organized into the ovum of this universe.

Primitive, or what I shall term celestial matter, was originally simple and homogeneous in its nature.* This matter was the same as that of which the rare and costly diamond now affords a specimen, and existed prior to the formation of sun, moon, or

* Plato calls matter the "receptacle, nurse, mother, place, and subject of all images; affirming that it is touched without sense, and comprehended by an *adulterate kind of reason.* The property thereof is to undergo the generation of all things, and to cherish them like a nurse, and to admit all forms; being of her own nature expert of all form, quality, and species. These things are imprinted and formed in her as in a table, and she admitteth their figures, not having of herself any form or quality. For, she could not be fit to receive the impressions of several forms, unless she were wholly void of all quality, and of those forms which she is about to receive. They who make sweet unguents of oil, make choice of that oil which hath the least scent; they who would imprint any figures in wax, first smooth and polish the matter, defacing all former figures. It is requisite that matter, capable of all things, if it must receive all forms, must not have the nature of any one of them, but must be subjected to all forms, without any quality or figure; and being such, it is neither a body nor incorporeal, but a body potentially; as brass is potentially a statue, because then it becomes a statue when it puts on the form thereof."—*Stanley's Lives of the Philosophers.*

planets,—motion, heat, or light.* Without matter we could have nothing to move, nothing to give off heat, nothing to yield us light. Motion, heat, and light, are qualities dependent upon matter. This primitive celestial matter consisted of an infinity of homogeneous but conflicting atoms, filling all space, which conflicting property being abstracted from them, they were empowered to conglomerate or unite to form an ovum or seed, (the first life of our universe.) To wit, some particles, having bestowed on them a more attractive power than others, those would gravitate to form a centre, while these would ascend to form a surface or boundary. Thus then, for the first time, I suppose that matter was divided into three distinct forms, or rather *three in one:* 1st, a solid central mass or seed, constantly increasing in size from the gravitating particles to its surface: 2dly, a fluid mass constantly in motion,

* "*He made darkness his secret (or hiding) place.*" PSALM xviii., 11. "Darkness was the state of the original heavens, before God formed the light, to which this passage seems to be an allusion. In Isaiah, the term *create* is applied to darkness, and *form* to the production of light; from which it appears that it was out of darkness that light was formed: and these two opposites seem to bear the same relation to each other as positive and negative electricity, or heat and cold. Darkness was that in which the Divine Spirit operated, when, by incubation, motion, followed by light and expansion, was educed, and the sea brake forth from the crust of the earth as from the womb; when the cloud was the garment thereof, and thick darkness a swaddling-band for it."—*Kirby.*

alternately rising and gravitating from the surface or circumference to the centre again: 3dly, a circumference of elastic matter capable of being extended ad infinitum.* This triple mass must have constituted an egg, and in my opinion such was the condition in which this universe existed *prior* to the formation of the sun, planets, stars, &c., during the period of the solid or oval stage, to which all matter endowed with life is amenable.

"There is in nature, from the lowest degree of created living matter to the highest range of intellectual being, an evident combination of *three principles*, which complete by their *union* one perfect substance, and which appear to be formed in the *likeness of the Creator himself*, as a type of the union of the three Divine attributes of the Trinity; and man, who is the microcosm, or lesser world in himself, in like manner is compounded of three substances."†

"In the philosophy of the Brahmins, the Vedas say, that Brahma reposed eternally in himself. This

* Anaxagoras maintained, "that the beginning of motion proceeding from the mind, the heavy bodies obtained the lowest place, as the earth; the light, the highest, as the fire; those betwixt both, the middle, as the air and water."—*Stanley*.

Lucretius believed that, in the vast body of chaos, the atoms composing the etherial, being the most elastic and volatile, rose highest in the scale of creation.

† Zuriel's Celestial Philosophy.

is the Hebrew moving on the face of the waters.* The Hebrew properly translated ought to be rendered *brooded*, not *moved*. The spirit of God brooded. The Hebrew word מרחפת mrchpt, does not mean to *move*, but correctly to *brood*, as a *hen on her eggs* before she *brings out her young*. The Hindoo, Sir W. Jones supposes to be copied from the Mosaic history. They are evidently the same idea."—*Higgins.*†

The Brahmins record the primordial state of the

* "'*And the spirit of God moved upon the face of the waters.*' In which passage, observes Mr. Kirwan, the word breath or spirit denotes an *invisible* elastic fluid, to wit, the great evaporation that took place as soon as the solids began to crystallize. '*Of God*,' is a well known Hebrew idiom denoting *great;* and the Hebrew term, מרחפת, in our common versions, rendered *moved*, occurs but three times in the whole course of the Bible; and, in every instance implies *internal agitation*, rather than simply *moving*, or hovering over: and the phrase, 'Spirit of God,' (רוח אלהים) rather refers, definitively, to the time, and cause, and mode, in which and by which the first process in the order of creation occurred, than generally and indefinitely to a vast or mighty wind of any sort. In consequence of which, with a slight change in the common punctuation, I would read the first two verses of the Book of Genesis as follows: 'In the beginning God created the heavens and the earth. The earth was yet a desolate waste, with darkness upon the face of the deep. And the Spirit of God agitated the waters to their surface.'"—*Mason Good's Notes on Lucretius.*

† "Whilst Brahm was thus disposed of, he was said to be surrounded with Maya, that is, the desire *to produce*, *eternal love*, *or illusion*. Maya is, according to the learned Hindoos, to diversify itself in *creating worlds*. She is regarded as the mother of nature, and of the inferior gods."—*Higgins.*

"The idea of the incubation of the spirit, of its being the principle of love that was in action, and that it produced the first motion, prevails, more or less, in all the cosmogonies. Aristophanes, in his

universe, as that of an egg in the subjoined passage, translated by Sir W. Jones.

"He whom the mind alone can perceive, having willed to produce various beings from his own divine substance, first, with a thought created the waters, and placed in them a *productive seed.* That seed became an egg, bright as gold, blazing like the luminary, with a thousand beams; and in that egg he was born himself, in the form of Brahma, the great forefather of all spirits. In

Aves, gives an account of the Grecian cosmogony, which proves that the heathen gods of the Greeks were all *subsequent to the original creation of matter*, in a passage, of which the following lines are nearly a literal translation.

> " Once chaos was and night, dark Erebus
> And ample Tartarus; but earth, and air,
> And heaven *were not.* First black-wing'd night
> In th' infinite gulfs of Erebus brought forth
> The *wind-nurs'd egg*, from which in *circling* hours,
> *Love*, the desir'd, his shoulders *golden*-wing'd,
> Sprung like a wind-swift vortex, he who mix'd
> With Chaos wing'd and dark, and Tartarus wide
> *Nested* our race, and them brought first to light.
> Ere love commingled all, *immortal gods*
> *Were none*, but from that commixture rose
> Heaven, sea, and earth, and gods incorruptible."

"'*Wind-nurs'd egg.*'—ὑπηνεμιον ὠον· Literally, the egg under the wind, alluding to the incubation of the Spirit.

"'*Love.*'—This is the motion infused by the Spirit into the chaos which was followed by light and expansion, and the whole harmonious circle of creation, in which there was no discord, but all was very good.

"'*His shoulders golden-wing'd.*'—Στιλβων νωτον πτερυγοιν χρυσαιν. Literally, his back shining with *two golden wings;* these two golden

that egg the great power sat inactive a whole year of the Creator, at the close of which, by his thought alone, he caused the egg to *divide itself;* and from its *two divisions* he framed the heavens above, and the earth beneath; and in the midst he placed the subtile ether, the eight regions, and the permanent receptacle of waters."

"The principle upon which all philosophical discussion proceeds is, that every *change* which we observe in the condition of things is considered by us as an *effect*, indicating the *agency*, characterizing the *kind*, and measuring the *degree* of its *cause*."* In the instance before us, God is

wings were, perhaps, light and the expansion, which carried love through his whole work.

"'*Sprung.*'—Εβλαστεν, germinated.

"'*Wind-swift vortex.*'—Εικως ανεμωκεσι διναις. Literally, like whirlwinds, or whirlpools, swift as the wind.

"'*He who mix'd with chaos wing'd and dark.*'—Οὗτος δε χαει πτεροεντι μιγεις νυχιω.—This describes *love or motion* entering into chaos and beginning to produce order.

"'*Nested our race.*'—Ενεοττευσε γενος ἡμετερον. The birds here claim an early origin. The allusion probably is to the *mundane egg*, and the birth of winged love.

"'*But from that commixture rose heaven, sea, and earth,*' *&c.*—Ευμμιγνομενων δ'ἑτερων ἑτεροις, εγενετ' ουρανος, οκεανος τε, καὶ γη, παντων τε θεων μακαρων γενος αφθιτον. Literally, 'one thing being mingled with another, heaven, ocean, and the earth, and the incorruptible race of all the immortal gods were produced.'

"It is evident from this passage that those whom the Greeks accounted their gods were the elements, the heavenly bodies, and other works of creation."—*Kirby.*

* Encyclopædia Britannica.

the *cause,* the matter *proceeding from the Father* is the agent, the kind of matter is *celestial,* and the effect is a *perfectly organized egg;* our universe, having impressed upon it this primitive form, became identified with the animal origin, and consequently must be subject to the laws of animal life, which exists successively in the oval, the fœtal, and the locomotive state.*

Of the size of the primitive ovum, we can only reason from analogy; we can compare a root to the seed whence it sprang, and we may, therefore, form some conclusion respecting the size of the uni-

* "Of the various systems of the cosmogony, according to the Hindoo writers, scarcely any one has been hitherto exhibited to the public in all the varied accounts from India, which does not mention the importance of the *egg* in the production of creation. In the Ayeen Akbery, the conjunction of Brahma and Teree is said to have produced an egg, which Mahadeo *divided into two parts;* of one-half the Dewtahs, or all celestial beings, were formed; of the remaining half all terrestial beings. The idea of the golden sphere above mentioned probably took its rise from the same source, and even the great triple divinity, Brahma, Veeshnu, and Seeva, are, in other Hindoo treatises of the cosmogony, said to have been formed from three eggs, dropped from the womb of Bhavani, the first created woman, and consort of Seeva, the last person in the divine triad. As Brahma, the first person in the Hindoo triad of Deity, was produced from an egg, so it is not a little remarkable that the very same kind of origin, in the hymns attributed to Orpheus, is allotted to the first-born deity, (the sun,) denominated Phanes by the Greeks; and it should not be forgotten, that, in the Orphic mysteries, the egg was considered as the emblem of generation and fecundity; whence it probably arose that the egg was also of principal importance in the sacrifices to Cybele, the fruitful mother of the gods."—*Maurice's Ancient Hindoostan.*

verse in its solid or oval state, from the magnitude it now offers to our contemplation, in its fluid or fœtal life. In Matthew, xiii. 31, we learn that "The kingdom of heaven is like to a *grain of mustard seed*, which a man took, and sowed in his field; which, indeed, is the *least of all seeds*, but when it is grown it is the greatest amongst herbs, and becometh a tree, so that the birds of the air come and lodge in the branches thereof."* It must be recollected that the diamond, which is the most solid species of matter, can expand itself so as to fill all space. Dr. Priestley observes, "We can form no conception of the *beginning of perfect solidity, and it is not an improbable conjecture, that all the elementary matter employed in the formation of the solar system, might be comprised in the capacity of a nutshell.*" And Newton asserts, that "*an inch of air rarified would fill all the planetary regions to Saturn, and this globe of earth, with all the known bodies of the universe together, might be compounded of no more than one inch of solid matter.*" "A seed," as the Scripture saith, "shall serve Him: it shall be accounted to the Lord for a generation." Psalm xxii. 30. Every ovum or

* "All these things spake Jesus unto the multitude in parables; and without a parable spake he not unto them: that it might be fulfilled which was spoken by the prophet, saying, I will open my mouth in parables; I will utter things which have been kept secret from the foundation of the world." *Matthew*, xiii. 34, 35.

seed is bounded in its nature; it cannot extend beyond certain limits. Having attained a definite size, the primitive ovum entered upon its second or fœtal stage of existence. The question may, indeed, have ere this suggested itself to the mind of my readers, "Will not this tremulous agitated mass of volatile fluid matter become worn out with hard labour and agitation: will it not stagnate and become putrid, changing its form into one lifeless inorganic mass, differing, however, from the first?" This question answers itself: putrefaction always precedes a new state of animal existence. In Matthew, xiii. 33, the "Kingdom of heaven is likened unto leaven, which a woman took and hid in three measures of meal till the whole was leavened." "The word leaven is applied to any mixture which makes a general change in the mass, and signifies something that depraves or corrupts that with which it is mixed, or is used to express any kind of moral contagion."* Davy says, "That during the *putrefaction* or *change* of certain animal and vegetable substances, *light is emitted;* and this is no more difficult to account for than the *heat* produced during similar operations."

Perfect matter is always threefold, and in the primitive ovum the three forms of matter, solid, fluid, and elastic, were united in one.† The

* Encyclopædia Britannica. † The case with every ovum.

change of the ovum to its fœtal state of existence, took place as follows: the centre, by continued gravitation or pressure, must have increased in both density and magnitude. This accumulation of solid particles into one mass, must, at some definite period, have produced friction or electricity. The centre, once inflamed, must have attracted the surrounding matter into one condensed focus, and while continually attracting, and drawing in this manner towards its centre, must have likewise been throwing off towards its surface; the particles thrown of in a state of combustion, upon reaching a certain distance gravitating from loss of heat.

This centre of inflamed diamond, constantly undergoing the process of combustion, is our sun, the heart, or first formed organ of the fœtal universe, from which all the other heavenly bodies have been formed in progression during the second stage of animal life, (the fluid or fœtal,) under which our universe now exists.

CHAP. II.

FŒTUS OF THE UNIVERSE.

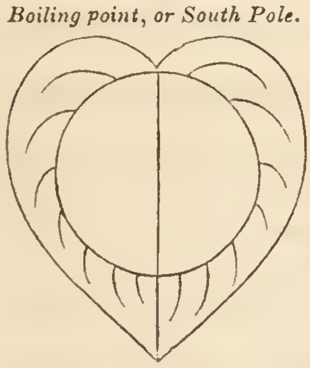
The fœtal life of this universe commenced with the first spark of electricity, elicited by friction in the centre of the ovum: on entering into this second stage of existence, primitive matter became changed from the oval to the cordiform shape,* which transformation took place in the following manner.

Heat, with some few exceptions, is well known to ascend. In boiling a kettle of water (to use this very familiar illustration), the heat commences from the bottom (or source), and forces its way up to the top, forming in its ascent a line of levity, till it finally escapes and gravitates as steam. Now the particles thrown off from the ovum, in the first instance, must have been projected upwards from the boiling point of matter, forcing their ascent in proportion to the violence of the stroke by which they were propelled. Losing gradually their elasticity, or fluid heat, these

* Another vital analogy between the universal origin and that of living creatures.

atoms, in falling, must have described the shape of a heart, and all converged to the freezing point, which, we perceive, must be situated on the line of gravity of the ovum immediately underneath its apex, or coldest portion. This lower part of the ovum answers to the bottom of a kettle, which is always comparatively cool, while its top is in a boiling state.

Boiling point, or South Pole.



Freezing point, or North Pole.

If the line I have described be drawn from this freezing point through the centre of the ovum to the opposite extreme or boiling point of its surface, it will cut the *poles* of our sun, and form the line of Apsides, which is the spine or gravitating line of the fœtus.* This line extends to the extremities of the universal sphere, dividing the sun or heart into two cavities, similar to the structure of that of a human being.† In the line of gravitation are situated the powers of galvanism (or animal magnetism), and electricity; both of which belong to animal life, and result from gravitation or pressure. Galvanism is elicited from fluid or boiling atoms, electricity from solid ones. Electricity, at the freezing point,

* Aphelion is the point in a planet's orbit farthest from the sun: Perihelion is that point in the orbit of a planet which is nearest to the sun, which point is called the lower *Apsis*. The line joining the two points, or Apses, is called the line of Apsides.

† The primordial egg of the Brahmins was divided into two parts.

awakens the latent spark of life; galvanism prescribes bounds to it: the central point on the line between these two forces of galvanism and electricity being our sun, the seat of life of the fœtus; life being, by these two opposite forces, kept active. The matter which becomes electric by means of heat, it is well known, is thus made to diverge: this species of matter identifies itself with that thrown off at the South Pole (or positive point of the universe), and conducts electricity: the law of repulsion by which such matter is caused to diverge, is situated in the point of galvanism; hence a spark is elicited and the matter diverges in the heart form. The non-conductors, on the other hand, require friction to produce electricity: such is the quality of matter in the negative or freezing point of the gravitating line, the North Pole of our universe, where is situated the force of attraction, by which it is made to unite and become electric; but no visible spark is elicited, though one is certainly the result of such union.*

* "Kant, and the disciples of his school, declared for that theory respecting *matter*, most of the tenets of which had before been propagated by the Abbé Boscowitch. They contended that matter was the consequence of two forces, *contraction and extension*, or, in plainer terms, *attraction and repulsion;* and believed that if the first power existed unopposed, all the works of nature would be contracted into a *mere point;* whilst, on the other hand, if the latter force was alone in being, they maintained that the materials composing the world, instead of being compressed into a nutshell, as has since been remarked, would be expanded equally over boundless space. In a

The matter at the boiling point is in a fluid state, that at the freezing in a solid or crystalline condition. Between the two extremes of the line of gravitation, all matter contained within the system of the universe is constantly ascending and descending from a state of complete rest to one of perfect activity and power, and vice versâ,* the

word, the followers of the German Philosopher occupied precisely the same position as different materialists have done both before and since. They considered the present sublime appearance of nature, the snow-capped mountain, the towering rock, the whole produce of the animal, vegetable, and mineral kingdoms,—the boundless ocean, the atmosphere, and the bright blue sky, to be the result of a balance between the two forces, attraction and repulsion."—*Hiley's Atomic Theory.* Life, in the centre of the gravitating line, kept active by these forces, is the balance; repulsion, which causes the matter to diverge, is the scale; attraction, which causes it to contract within certain limits, is the compass. Here then are the natural balance, scale, and compass, of all matter.

* "Lord Verulam's two hands of nature, whereby she chiefly worketh, *heat and cold*, synonymous according to some, with positive and negative electricity; the *plastic nature* of Cudworth and some of the ancients; the spirit of nature of Dr. Henry More; and the ether of Sir Isaac Newton, all seem to express or imply an agency between the Deity and the visible world, directed by Him. *Attraction and repulsion, centripetal and centrifugal* forces, or universal gravitation, all imply a power or powers in action, that are something more than names and nonentities, that are moving in two directions, and consist of antagonist forces."—*Kirby.*

"Among the ancient philosophers, Aniximander believed that heaven consisted of *heat and cold mixed;* Archelaus, that the causes of generation were two, *heat and cold;* and Anaximenes maintained that the contraction and condensation of matter was *cold*, the laxation and rarity thereof, *heat.*"—*Stanley.*

whole is still the same matter of which the ovum was composed, but existing in a different state:* it is still divided, as was the ovum, into *three forms of matter in one;* the solid centre or sun, in its state of combustion, the undulating fluid which surrounds it, and an aërial or elastic boundary, which prescribes the size and figure of the fœtus, and is in fact its web of life. All these three several divisions, (which will hereafter be particularly described,) as they increase in size extend the line of gravitation (by which they are retained in their proper places,) the whole mass expanding gradually into the space or matter within which they are enclosed.†

* "A change of condition does not imply a change of substance. A particle of matter may at one time be in a fluid, at another in a solid, at another in a gaseous state; it may be now a part of a pebble, now of an oak, now of a man; but it is still the same particle. Its condition is changed; it exists in different states; but it is substantially the same."—*Dr. Crombie's Natural Theology.*

† "When a bird's egg is examined, it is found to consist of three parts: the chick, the yolk in which the chick is placed, and the white in which the yolk swims. The yolk is *lighter than the white,* and it is attached to it at two points, joined by a line, or rather plane, below the centre of gravity of the yolk. From this arrangement it must follow, that the chick is always uppermost, roll the egg how you will; consequently, the chick is always kept nearest to the breast or belly of the mother, while she is sitting. Suppose, then, that any one acquainted with the laws of motion, had to contrive things so as to secure this position for the little speck or sac in question, in order to its receiving the necessary heat from the hen; could he proceed otherwise than by placing it in the lighter liquid, and suspending that liquid in the heavier, so that its centre of gravity should be

Several facts come under my attention in this place as corroborative of the preceding theory.

"If *iron filings* be shaken through a sieve upon a paper that covers a bar magnet, the filings will become *magnets*, and be arranged by the incum-

above the line or plane of suspension? Assuredly not; for in no other way could his purpose be accomplished. This position is attained by a strict induction; it is supported by the same kind of evidence on which all physical truths rest. But it leads by a single step to another truth in Natural Theology, that the egg must have been formed by some hand skilful in mechanism, and acting under a knowledge of dynamics."—*Lord Brougham's Natural Theology.*

"In contemplating the stars, it is observed that some of them have the singular property of neither rising in the east nor setting in the west; but seem to turn round one *uninvariable point*, near which is placed a *single star*, called the *pole, or pole star.* This point is more or less elevated according to the different parts of the earth from which we take our view. The inhabitants of Lapland, for instance, see it much more elevated above the horizon, or more vertical, than we do; we see it more vertical than it appears to the inhabitants of France or Spain; and they again, see it more elevated than the inhabitants of Barbary. By continually travelling south, this star would at length seem depressed in the horizon, and another point would appear directly opposite to it, round which the stars in the southern part of the horizon would seem to turn. In this part of the heavens, however, *there is no star* so near the pole as there is in the northern part; neither is the number of stars in the southern part of the heavens so great as in the northern. Supposing us still to travel southward, the north-pole would then entirely disappear, and the whole hemisphere would appear to turn round a single point in the south, as the northern hemisphere appears to us to turn round the pole star. The general appearance of the heavens, therefore, is that of a vast concave sphere, turning round *two points* fixed in the north and south parts of it, once in twenty-four hours."—*Encyclopædia Britannica.*

The north is the electric, the south the galvanic or heart-shaped end.

bent magnet into very beautiful *curves.* Upon the *two ends* of the magnet, the filings stand, preponderate, and seem buttresses of *arches* that would stand over the magnet; on the sides of the magnet they *slope or incline,* and seem buttresses of inclining arches; so that if filings could be sustained *all round the magnet above and below,* they would probably assume an egg-like figure!! This I conceive to be favorable to the idea of a *positive and negative magnetism.* Electricity, in its efforts to produce an *equilibrium,* always acts in *curves;* so does magnetism."

"If I place two bar magnets about two inches from each other, in a line, and with a positive to a negative end, and place paper over them, and sift filings as before, they will be arranged in beautiful curves."*

Mrs. Somerville says "What magnetic properties the sun and planets may have, it is impossible to conjecture, although their rotation might lead us to infer that they are similar to the earth in this respect. According to the observations of MM. Biot and Gay Lussac, during their aërostatic expedition, the *magnetic action is not confined to the* surface of *the earth, but extends into space.* A decrease in its intensity is perceptible, and, as it

* Lydiard on Metals.

most likely follows the ratio of the inverse square of the distance, it *must extend indefinitely*."*

"The Stoics, who uniformly contended for the spherical figure of the earth and planets, contended at the same time for the spherical figure of the universe itself; and, indeed, appear to have advanced the spherical figure of the universe as a reason why the stars and planets should partake of a similar configuration; believing that the same kind of *gravitation* existed through the universe at large, which they contended did exist throughout individual planets: by which the universe was kept in perpetual action, and the earth, and every other orb, was continually tending towards one common centre. This opinion of the Stoics, however, respecting both the universe and the solar system,

* "The centre of gravity of the solar system lies within the body of the sun, because his mass is much greater than the masses of all the planets and satellites added together.—Future astronomers will know, from its immutability or variation, whether the sun and his attendants are connected or not with the other systems of the universe. Should there be no link between them, it may be inferred from the rotation of the sun, *that the centre of gravity of the system situate within his mass, describes a straight line in this invariable plane or great equator of the solar system*, which, unaffected by the changes of time, will maintain its stability through endless ages."—*Mrs. Somerville.*

"What law, for instance, can be more simple than that of gravitation, to which *all material bodies*, whatever be their size, figure, or other properties, and whatsoever be their relative positions, are equally subjected; and of which the observations of modern astronomers have rendered it probable that the influence extends to the remotest regions of space?"—*Dr. Roget.*

as to their moving around, and tending towards some common centre, is corroborated by modern observations. The common centre of universal nature, in the opinion of Dr. Herschel, consists of a mass of opake and chaotic matter, (*Philos. Trans.* vol. 84,) from which he thinks it probable that all the systems of the universe have been emitted by some strong projectile force, not dissimilar to the sudden explosions which frequently take place in volcanoes and earthquakes."*

It is worthy of notice on the present subject, that galvanism, or animal magnetism, has the power of *evaporating diamonds*, and that gem "when rubbed, whether rough or polished, shows positive electricity; whereas quartz, and the other precious stones, if rough, afford negative electricity; but when polished, positive electricity. In general, it does not retain this electricity above half an hour. It becomes phosphorescent when exposed to the rays of the sun."†

The line of gravitation is frequently mentioned in Scripture as the *pillar;* or the rod of iron.‡

* "Epicurus also believed that in the centre of the universe exists a vast mass of elementary matter, whence primitive atoms are perpetually flowing forth."—*M. Good.*

† Jameson's Mineralogy.

‡ "It was customary with the heathens to worship stones formed in the shape of a pillar, which they rendered sacred by anointing with oil, in the name of the deity they intended to represent. When this ceremony was performed, the ignorant idolaters who fancied that

In Exodus, xiii. 21, we find, the Lord went before the children of Israel "by day in a pillar of a cloud, to lead them the way; and by night in a pillar of fire, to give them light; to go by day and night: He took not away the pillar of the cloud by day, nor the pillar of fire by night, from before the people." And, in Job, xxvi. 11, we are told that "the *pillars of heaven* tremble at the reproof of God." It is recorded that Anaxagoras "observed in the heavens a great unaccustomed light, of the likeness of a huge pillar, and that it shined for many days."*

their gods could not hear them but when they were visible, supposed that the intelligences by which the sun and planets were animated, took possession, in some unaccountable manner, of the consecrated pillars, and were as well pleased with the prayers and praises offered up before those pillars, as with the devotions which were addressed towards the luminaries themselves. Hence Sanchoniathon calls them animated or living stones, λιδοϐιεμψν χους, from the portion of the Divine Spirit which was believed to reside in them; and as they were dedicated to the host of heaven, they were generally erected on the tops of mountains; or, in countries which, like Egypt, were low and level, they were elevated to a great height by the labour of men."—*Ency. Britannica.*

* "The parhelia, or mock suns, usually have a stream of white pyramidal light extending like the tail of a comet from them. The Zodiacal light is also a pyramid of light which sometimes appears before sunrise, having the sun for its basis; the cause is not certainly known; but the most probable opinion is, that it proceeds from rays of light thrown off from the sun by his rotation on his axis."—*Pinnock.* This must be a manifestation of the line we have described, and the reason such appearances are of unfrequent occurrence must be the thickness of our atmosphere. The Zodiacal light generally appears

When, therefore, I have occasion to mention this pillar, I must not be understood to speak of an immaterial and figurative object alone, as of

"about October and March, that being the time of our shortest twilight; for it cannot be seen in the twilight."—*Ibid.*

Plato says that "matter, as far as it put on the figure of a *pyramid*, became fire, and mounted upward: for that figure is the most easy to cut and to divide, as consisting of fewest triangles; and therefore is the rarest of all figures."—*Stanley.*

"Our English word pyramid (says a very ingenious writer in the "*Gentleman's Magazine*," for June 1794,) is directly derived from the Latin *pyramis*, and mediately from the Greek *πυραμις*; all denoting the same mathematical figure. The original of the whole seems to be the Egyptian word *pyramoua*, which, we are told by Oriental scholars, signifies light, or a ray of light. From this coptic vocable the word *πυρ*, in Greek, signifying fire, is probably descended; as the flames of fire assume that conical or pyramidal form which the solar rays commonly display; and as it is natural for the mind to distinguish its objects rather by their external qualities, and those obvious and interesting appearances which they exhibit to the senses, than by their constituent and inseparable properties.

"The ancient Egyptians seem to have penetrated very far into the mysteries of nature, and although their superstition appears at first sight to be extremely gross and absurd, yet it is very probable that their deities were only emblematical personages, representing by sensible images the grand effects or presiding principles which they supposed to exist in the universe. Thus the moon was called Isis, and the sun Osiris; and to the honour of the last deity, from whose visible influence and creative energy all things seem to spring into existence, it is not improbable that the Egyptians erected those stupendous monuments, and dedicated them to him as temples or altars. It was natural to build them in that shape which the rays of the sun display when discovered to the eye, and which they observed to be the same in terrestrial flame, because this circumstance was combined in their imaginations with the attribute which they adored. If they were temples dedicated to the sun, it seems a natural consequence that they should likewise be places of sepulture for kings and illustrious men, as the place which they covered would be considered

lines used to express certain ideas in geometry, but of an actual substantial line or pillar which

as consecrated ground. This hypothesis is common, and is not contradicted by the present reasoning. But, considering them as altars, and as most travellers agree that they were never finished, but terminate in a square horizontal surface, it would not be refining too much to venture an assertion that, in great and solemn acts of adoration, the Egyptians constructed fires, the flames of which should terminate in the vertex of the pyramid, and so complete that emanation of their deity which they admired and adored.

"As far, therefore, as we are justified in forming any conclusion on so dark a subject, we may venture to say, that the Egyptian pyramids were temples or altars dedicated to the sun, as the *material* representative of that invisible power which creates, governs, and pervades the whole system of nature." *Ency. Britannica.*—"'The sun was worshipped as a deity by the Persians, Africans, Egyptians, and Phœnicians; indeed, nearly all the heathen nations, especially under the symbol of fire.' The temples dedicated to the sun, or the deity of fire, were each of them denominated a pyramid, which is almost literally Pi—Ur—Am—Ait; and with the contraction P'Ur—Am—Ait, 'the place of inspiration of the radiant Ham,' or, 'Ham of the Sun.' They were built upon one model, and it is easy to perceive that this model was deduced from the figure of an ascending flame of fire, which originates with a broad basis, and terminates in a pointed apex. Egypt and Hindu abound with buildings of this description, and the Pagodas of China do not essentially vary from it. Hercules, who is a deity of high antiquity among the eastern nations, and, in reality, is only another name for Jupiter or Ham, is denominated from radicals altogether analogous with the term Pyramid; for it is literally Ur—Cal—Es, 'an eminence dedicated to the effulgence of fire;' or rather, 'an ascending flame of fire.' And the descendants of the Heraclidæ, in India, are to this day denominated Surya Bans, which is literally 'children of the sun.' This appellation, indeed, children or descendants of the Sun, of Xuth, or Jupiter Ammon, was, in a more restricted sense, conferred upon the heroes of antiquity alone; but, in a more general sense, upon all mankind, since Hammon, or Ham the Sun, was worshipped as the common father of all." —*Mason Good.*

passes through the body of the solar system, on which the sun revolves, and on which also is performed every action of the matter within his sphere; in the southern or *upper* half, by the force of repulsion; in the northern or *lower*, by that of attraction; both these laws being subordinate to the primary one of gravitation, by which the line itself was formed.*

I have shown how the sun was formed,

> "The golden-tressed sun, whose radiant lamp,
> Earth, ocean, and the fane of Heaven bedews;"

this central adamantine mass, like the heart in the fœtal economy, was the first formed organ in the universe, whence the other heavenly bodies

* "Homer, in his Iliad, describes 'a golden chain which connects the earth and Heavens, from which God and man are alike suspended.' Plato conceived, that under this figure, the poet meant to represent the sun, whose animating influence, as he travels through the ecliptic, connects and binds the whole system together. Milton has given this a literal meaning, for, with a manifest reference to the passage before us, he represents Satan as looking towards the eternal throne, and beholding

> "Fast by, hanging on a *golden chain*
> This pendant world."

Mason Good's Notes on Lucretius.

"All is linked together," said M. Cuvier, in alluding to the creation, "all is dependant; all existence is chained to other existence, and that chain which connects them, and of which we can only see some comparatively insignificant portions, is infinite in extent, in space, in time."

have all owed their successive existence and subsequent support.* The sun is the seat of life in the celestial fœtus, the dispenser of all its laws; he is the primary source of all motion,† heat, and light, and his sphere comprises the whole universe.

* "Throughout all the world, the first object of idolatry seems to have been a plain unwrought stone, placed in the ground as an emblem of the generative or procreative powers of nature. In its origin this seems to have been of a very simple and inoffensive character, though at last it came to be abused to the grossest and most superstitious purposes. In all parts of India, these stones are to be found under the name of Linghams. They are many of them of *immense size*, and generally stand near some magnificent temple. I believe there is no instance of any temple being found without them. It is probable that most of them, at least of those that are very ancient, were themselves the first objects of adoration, and that the temples were built near to them, as in a place of peculiar sanctity. In time the idol within the temple might take away part of the veneration from the pillar, but yet it is always considered with profound respect and veneration. They are seldom any part of the building of the temple. *They are mostly cones*, with the top shaped *into the form of a heart*. They are known to be emblems of the creative power. The Tyrians had two near Tyre, and probably the pillars of Hercules were stones of this description, set up by the Phœnicians."

Higgins's Celtic Druids.

† Quintus Curtius declares it to have been an immemorial custom among the Persians, for the army never to march before the rising of the sun; that a trumpet, sounding from the King's pavilion, proclaimed the first appearance of its beam, and that a golden image of its orb, inclosed in a circle of crystal, was then displayed in the front of that pavilion, which diffused so wide a splendor that it was seen through the whole camp. Roused to action by the solar ray, when the army began to move, they regulated the order of their march by the motions of their celestial leader. They bore aloft the expressive symbols of his magnificence in bestowing upon them light and heat; and they kept constantly before their eyes a conspicuous memorial of his own diurnal progress through the expanse of heaven. Immediately after came the Magi, chanting hymns, after the fashion of

"One common soul
Inspires, and feeds, and animates the whole,
This active mind, infus'd through all the space,
Unites, and mingles with the mighty mass."—*Dryden.*

The whole of this vast machine of the universe has progressed from one simple solid egg of diamond. This egg, the heart and centre of our sun, (see diagram, page 21,) is in a constant state of combustion, throwing off from its mouth or cavity* particles of boiling hot diamond, which liquid flame† rises to a certain height by the combustion

their country, in honour of Mithra. Then followed 365 youths, representing the days of the reformed year, and clothed in vestments of a bright red or flame colour. To these succeeded the chariot of Jupiter, (that is, the *God of the firmament*, the Eendra of the Hindoos,) drawn by white horses, and followed by one of exceeding magnitude and superior beauty, called, "the Horse of the Sun," and, in a peculiar manner consecrated to that deity. The grooms appointed to train and conduct these horses were arrayed in white garments, and bore in their hands *golden rods, or wands, pointed at the end in imitation of the solar ray.*"—*Maurice's Ancient Hindoostan.*

* Anaximander supposed the sun to be surrounded by a hollow circle, like a chariot wheel, full of fire; in one part of which he says, "there is a mouth at which the fire is seen as out of the hole of a flute, which is the sun, equal in bigness to the earth." This philosopher, as well as Anaximenes, believed that the stopping of this hole, out of which the fire issues, occasioned the sun's eclipse." —*Stanley.* Anaxagoras also believed the sun to be "a burning plate or stone, many times bigger than Peloponnesus."—*Stanley.* In the origin of heat we found that the flame *ascended.* "The flame of the comet goes before the wind it floats and flies in; consequently," says Finleyson, "it must be the head and not the tail: the flame of the candle is called the *top,* not the bottom, and the flame goes with the wind, and never can go against it."

† The philosopher, Zeno, was of opinion, that "the sun being fiery, is either like that fire which is requisite to the use of life, or

or electric force with which it is projected* from the body of the sun, and then losing its heat, gravitates (as water does from a fountain) to his apex, which is naturally adapted for the deposition of planetary bodies. Here the matter becomes stationary, uniting by the attraction of cohesion into the primitive or oval form, and in this way have all the planets been first generated from the body of the sun in the order of their respective orbits, from Mercury outwards to the Georgium Sidus, each becoming in turn the extreme point of cold, (or apex of the universe,) and extending the sphere of the fœtus. With respect to the creation

unto that which is contained in the bodies of living creatures; but this our fire, which the use of life requireth, is a consumer of all things, disturbeth and despatcheth all things. On the contrary, the other is corporeal, vital, and salutary; it conserveth all things, it nourisheth, increaseth, sustaineth, and affecteth with sense; therefore,' saith he, "there's no question to which of these fires the sun is like, for he causeth all things to flourish and sprout up, according to their several kinds."—*Stanley.*

"By this the fire, through whose fair beams
Life from above to mankind streams,
Is kindled in our hearts, which glow
Dying, yet dying greater grow;
By this immortal fountain flows,
Which all Heaven forms below, bestows;
By this descends that shower of light
Which upwards doth our minds invite;
By this the eternal sun inspires,
And souls with sacred lustre fires."

Stanley's Plato.

* "Matter moves always in the direction in which it is struck."—*Dr. Ritchie.*

of planetary matter, Whewell, in the "Bridgewater Treatises," enquires, "How came the sun and its atmosphere to have such materials, such motions, such a constitution, that these consequences followed from their primordial condition? How came the parent vapour thus to be capable of coherence, separation, contraction, solidification? How came the law of its motion, attraction, repulsion, condensation, to be so fixed, as to lead to a beautiful and harmonious system in the end? How came it to be neither too fluid nor too tenacious, to contract neither too quickly nor too slowly, for the successive formation of the several planetary bodies? How came that substance which at one time was a luminous vapour, to be at a subsequent period solids and fluids of many various kinds? What but design and intelligence prepared and tempered this previously acting element, so that it should, by its natural changes, produce such an orderly system? And if, in this way, we suppose a planet to be produced, what sort of a body would it be? Something, it may be presumed, resembling a large meteoric stone. How came this mass to be covered with motion and organization, with life and happiness? What primitive cause stocked it with plants and animals, and produced all the wonderful and subtle contrivances which we find in their structure, all the wide and profound mutual dependencies which we trace in their economy? Was

man, with his thought and feeling, his powers and hopes, his will and conscience, also produced as an ultimate result of the condensation of the solar atmosphere?"

All the phenomena of this universe are the result of the condensation of the solar atmosphere: the law by which this is effected is gravitation; and the varieties depend entirely on the degree in which this law is effected.

> "Nor deem it strange that so minute a sun
> Should pour forth flame sufficient Heaven to fill,
> And earth, and ocean, and whate'er exists,
> Tinge with its glittering dew; for, from abroad
> The myriad seeds of fire, dispers'd at large
> Through all things, here as to their fountain flow,
> And hence well forth o'er all th' exulting world
> In boundless flood: see'st thou how small a spring
> Feeds with its liquid treasures meads, full oft,
> Of amplest breadth, and all their glebe o'erflows?"
>
> *Mason Good's Lucretius.*

Every molecule or particle of the sun's matter is as perfect as his own body; like the sun itself, it has a pole or axis, one end of which has the power of repulsion or galvanism, the other that of attraction or electricity.* When projected, these par-

* Dr. Prout says, that "The powers of gravitation, inertia, and attraction, appear to be associated, and to reside in every *individual atom of matter in the universe:* hence every atom mutually attracts and is attracted by, every other atom. The polarizing forces, on the other hand, are evidently *disassociated,* and reside in *different parts of the same mass:* hence, this mass can in *no instance be a mathematical*

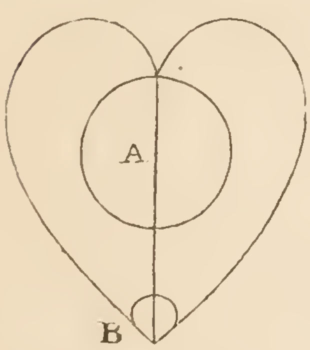
ticles undergo a change of temperature, their exterior becoming cold or condensed: thus, the centre of the particle becomes the boiling or warmest portion, the part surrounding that centre being gradations from the point of extreme heat to the point of extreme cold in the exterior, (which exterior answers to the universal boundary.) The heat of each ray thrown off in a fluid state by combustion, is deposited at the apex or smaller end of the carbonized egg, beneath which it falls in the process of crystallization.* Thus do these primitive particles descend in the universe, through the successive degrees from the point of extreme heat to that of extreme cold: a portion of their elastic fluid lost by them in their progress, forming a vein or travelling case, by which they are protected to the

point (*or atom*), but must consist of at least *two parts;* hence, also, as all matter appears to possess polarity, matter must exist in the state of *mass or molecule*, each of which *molecules* must occupy actual space. Thus, the forces of gravitation and those of polarization are quite distinct. The forces of gravitation are primordial, and probably co-existent with matter; while the forces of polarization have more of a derivative or resultant character, and are evidently subordinate to those of gravitation."

* "The particles of all solid bodies that can be dissolved by heat, or held in solution by fluids, have a tendency to unite when slowly cooled or evaporated, and to arrange themselves into regular forms, called crystals." – *Bakewell's Geology.*

"Every animal texture appears to be formed from matter that was originally in a fluid state; the particles of which they are composed having been brought together, and afterwards concreting by a process which may, by a metaphor borrowed from physical science, be termed *animal crystallization.*"—*Dr. Roget.*

place of destination and likewise attached to their primary, the heart: this answers to the sides which Sir Isaac Newton believed each ray or particle of the sun to possess.* The place of deposition for planetary matter is the point of attraction, and here the egg, whose progress we have just traced, encounters another egg, thrown off from the opposite direction of the heart; this, like the former, is in a crystalline condition, and the two eggs, by the force of attraction, become incorporated into one, which is the seed, embryon, or corner-stone of the planetary body about to be formed. By cutting each other, the two eggs would form a central yolk, a medium, and a circumference; while



the line of gravity, joining their centres, would be common to both, forming for the planet a line of electricity, similar to that of the universe, but on the most minute scale;† (see diagram, in which A is the sun, B the planetary body.) Nothing belonging to *this*

* "Why should the nebulous matter grow cooler and cooler? Why should it not retain for ever the same degree of heat, whatever heat be? If heat be a *fluid*, if to cool be to *part with* this fluid, as some philosophers suppose, what becomes of the fluid heat of the nebulous matter, as the matter cools down? Into what unoccupied region does it find its way?"—*Whewell.*

† "Mr. Cunningham, Surgeon R. N., has lately made the interesting discovery of electric conductors being, to a certain extent, also magnetic conductors, and of non-electric conductors being non-magnetic conductors; thereby adding another powerful proof to the many

universe could ever have been in a state of chaos, the single atom presenting the same order and harmony as the perfect whole. Keith says, "The centre of gravity of two bodies is a point, on which, if they were both supported by a *line* joining their centres, they would rest in equilibrium." This mode of forming the planets is expressly alluded to in the following scriptural passages: "He stretcheth the North Pole *out of chaos*,* He hangeth the world upon nothing."† And in the Lord's question to Job,

already existing of the identity of the electric and magnetic bodies. The above result was obtained by placing successively in a copper wire helix, connecting the poles of a galvanic battery, pieces of steel and of iron, either united end to end by brass solder, or simply retained in close contact in the above position by a copper tube, fitting tightly round the point of junction, each needle being found, on removal from the helix, to be a perfect magnet with two poles, the same as if it had been constructed in the usual way, of only one piece of steel. No interchange of magnetism took place when the union of the pieces was effected by sealing-wax, or when the intervening brass was an inch long, the greatest extent of solder between the magnetized pieces being the twelfth of an inch. When two pieces of iron or steel were placed at a distance from each other in the helix, each piece became a distinct magnet; but when approximated nearer, they closed with a snapping noise, and formed a single magnet between them, one piece becoming a North Pole and the other a South. This construction of a magnet promises to be of importance in preserving, to a greater extent, the magnetic properties of the mariner's needle; even soft iron, which under other circumstances loses its polarity as soon as the magnet is removed, being found to retain it when united in pieces as above."—*Morning Chronicle*, 1835.

* *Job*, xxvi. 7.—"The North, or North Pole, is here used synecdochally for the heavens at large, the inhabitants of Idumæa knowing nothing of the South."

† Thus, in the words of the poet,—

"Earth, self-balanc'd, on her centre hung."—*Milton.*

"Where wast thou when I laid the foundations of the earth? Declare, if thou hast understanding, who hath laid the measures thereof, if thou knowest? Or who hath *stretched the line* upon it?* *Whereupon* are the *foundations thereof fastened?* Or who laid the *corner stone* thereof?" Every corner stone or foundation of an edifice is laid in the commencement of the structure, and thus the matter in the point of attraction, originally consisted of layers of these primitive particles, one above the other: these layers being contained within the descending cone formed by the line of gravitation and the travelling-case or boundary of the first two eggs, (see diagram, page 39;) the whole mass being deposited in much the same fashion as that in which the female gnat places her eggs.† Thus

* "Plato says that the earth is fixed in the midst of all, round about the axletree, which passes through the midst of the world. It is the observer of night and day, the most ancient of all gods in heaven. Next the soul of the world, it affordeth us most nutriture; about it the heavens move, and itself is a kind of star; *it remaineth in its proper place, which, by reason of its even weight, is the centre.*"—*Stanley.*

† The following is the method employed by the gnat in depositing its eggs. "Each egg is shaped like an olive or a powder-flask, and, by itself, would sink to the bottom of the water; yet the gnat puts the whole three hundred together so skilfully, that they all swim on the surface, safe and unhurt, until the larvæ, or grubs of the gnats, are hatched. A gnat has six legs; the four fore-legs she rests on a floating leaf, or on the side of a bucket, if she is in water contained in such vessel; and her body is thus held level with the water, except the last ring of her tail, which is a little raised. She then begins to use her two hind-legs, which she crosses in the shape of the letter X, the open part of which, next the tail, serves as a kind of scaffold for the eggs she lays, until the boat is nearly formed. Each egg,

the sun being porous, his materials filter through the sides of his body into the cone formed by the deposition of the planet; all natural machinery being constructed in such a manner as to perform the double office of a fountain, and also of a filtering machine. All superfluous matter is thrown off by the first function from the mouth or cavity of the heart, and gravitates to its apex, forming a deposition of matter for building organs for the primary: by the second function those organs are supplied with nutriment.* Thus has planet after planet

when laid, is covered with a sort of glue; the gnat holds the first-laid egg in the crossed legs until the second is placed by its side and fastened to it: she then glues to these another egg, making a triangle or three-sided figure; and this is the beginning of the boat. Thus she goes on piling egg upon egg, always keeping the boat in proper shape by her useful hind-legs; and, as it grows in size she pushes it from her by degrees, still adding to the unfinished end next her body. When the boat is half-built, her hind legs are stretched out like two parallel lines, and she holds up the boat as cleverly as if it were done with two outstretched arms. It possesses not only the form but most of the other properties of a boat, its fore and hind parts being sharper and higher than the middle; the lower part on which it always floats being convex, and the upper part concave. It is likewise so buoyant that no agitation of the water, however violent, can sink it; and, what is still more worthy of admiration, although hollow, it will not sink. Mr. Kirby says, 'to put this to the test, I put half-a-dozen of these boats upon the surface of a tumbler half-full of water. I then poured upon them a stream of that element, from the mouth of a quart-bottle held a foot above them. Yet, after this treatment, which was so rough as actually to project one out of the glass, I found them floating as before, and not a drop of water within their cavity.'"—*Chambers' Edinburgh Journal.*

* "Many fluids contain minute masses of matter, generally having a globular shape, which can be seen only by means of the microscope,

been formed, and continued to enlarge by absorbing* fresh nourishment from the parent sun: like their primary, they have progressed from a minute to a definite size,† and during their solid or oval state of existence, they have been fixed upon the line of gravitation in a state of latent heat.‡

The density of the planets increases as their orbits recede from the sun, and they may be com-

and which float in the surrounding liquid, and often thicken it in a very sensible manner. We next perceive that these globules have, in many instances, cohered, so as to form solid masses; or have united in lines, so as to constitute fibres. We find these fibres collecting and adhering together in bundles, or interwoven and agglutinated, composing various other forms of texture: sometimes resembling a loose network of filaments; sometimes constituting laminæ, or plates; and at other times both plates and filament combining to form an irregular spongy fabric. These various tissues, again, may themselves be regarded as the *constituent materials of which the several organs of the body are constructed, with different degrees of complication, according to the respective functions which they are called upon to perform.*"—*Dr. Roget.*

* "Absorption encreases the size of a body."—*Dr. Ritchie.*

† "Microscopic observations teach us that the embryo of an organic being contains, at a certain period of its formation, the rudiments of the future vegetable or animal structure, into which it is gradually transformed, by the *slow and successive expansion and development of all its parts.* The subsequent processes of nutrition do nothing more than fill up the outlines already sketched on the living canvass." *Dr. Roget.*

‡ "Anaximander believed that the stars are globous substances, consisting of air full of fire, *respiring flames at some certain part.*" He was of opinion, "that their substance was of a fiery nature, invisible, earthly bodies intermixed with them; and that they are inherent as *nails in crystal.*" Archelaus, the Greek philosopher, maintained, "that they were *burning iron plates;*" and Anaxagoras imagined, "that falling stars are shot down from the ether as sparkles, and therefore soon extinguished."—*Stanley.*

pared to the several metals;* Mercury, the most volatile, being placed nearest to that luminary. This may be illustrated in the words of Bentley:

* "It has not hitherto been satisfactorily accounted for that we designate the planets in astronomical, and metals in chemical science, by the same characters, otherwise than that the astronomy of the Greeks came to us through the Arabians, the supposed inventors of chemistry; but to those who are chemists, it must be evident that those ancient Chaldeans who were acquainted with the nature and wonderful properties of *fire*, and who on that account adored it as a divinity, could not possibly be strangers to so exalted and noble a science. In fact, astronomy and chemistry were sister sciences in those early days, and this mode of designating the different planets and metals by congenial characters descended to the Arabians from an older school, even from that of Zoroaster and the Persian Mithra; in the sacred cavern-temples of which deity, we have observed from Celsus, the planets were first designated according to the various metals. In fact, they thought that those planets were composed of, or at least principally abounded in, that species of metal by which they were so distinguished, or else in a high degree possessed qualities resembling those metals. Thus, the sun, being the brightest of the orbs, was represented by a circle, the symbol of perfection; and gold, being the most pure of metals, was symbolized by the same figure. The moon being the next orb in apparent purity and brightness, was shadowed out by silver, the second in rank of the precious metals; and the crescent became the discriminating character of both. Mars was thought to abound in copper, because his aspect is of a dusky red colour. Mercury is the symbolic character of quicksilver, not only on account of the brilliant whiteness which his lucid orb displays, but because his progress through the Heavens was made with rapidity, like the motions of that active and penetrating metal. Saturn, on the other hand, whose slow motion among the fixed stars is scarcely perceptible, is properly enough symbolized by that lead of which his astronomical designation is the chemical character; there is likewise in lead a bluish cast, which is in a very marked manner the colour of that distant orb. Though this difference in the colour of the planets may not be so strikingly perceptible to astronomers in the foggy atmosphere of the British islands, yet in the cloudless sky and pure air of Chaldea, it doubtless was distinctly discernible. The elder

"Suppose the earth removed, and placed nearer to the sun, in the orbit of Mercury, there the *whole ocean would boil with extremity of heat*." Prout observes, in the Bridgewater Treatises, "Since there is nothing peculiar in the elements of which organized beings are composed, and no reason can be assigned why carbon and other elements have been chosen for their formation, we are compelled to ascribe the choice of these materials to the will of the great Creator. But, as He never acts without a purpose, we cannot doubt that these elements have been selected for some specific design, which design has probably been, that the fabric of the beings dwelling on this earth, might be adapted to its general position in the solar system. When we consider that the same heat and the same light are diffused by the same central sun; that the whole

Cassini, who observed the planet Venus in Italy, was enabled, in the clear atmosphere of that country, to make discoveries, which his son afterwards in vain attempted to verify in the grosser one of Paris. Indeed the Chaldeans are said to have made the same observations in regard to the various colours of the fixed stars, which require still nicer inspection; and from those colours, in their romantic schemes of judicial astrology, they assigned certain series of them to one planet, and certain other series of them to another. Those of a blue tinge they made kindred with the house of Saturn; those of a reddish tinge, with Mars; those of a yellowish cast, they said belonged to the house of Venus; those of brilliant whiteness, to that of Jupiter. The dazzling Mercury had his allies in the vast expanse; and the same influences which emanated from the silver and golden rays of the solar and lunar orbs, were supposed to be equally diffused from those orbs which were of congenial hue."—*Maurice's Ancient Hindoostan.*

system obeys the same laws, and that the different planets influence and are influenced by each other; we are warranted in believing that the planets are essentially composed of the same *elementary principles*. But, admitting that the heat and light of the sun are distributed according to the laws which they seem universally to obey, the heat in Mercury close to the sun, and the cold in Saturn at the other extreme, must be alike so intense, that organized beings, such as inhabit *this earth*, could not exist for a moment. In the different planets, therefore, may not the living principle be attached to different elements, more or less fixed or volatile, as the distance of the planet from the sun may seem to require?" The quality of the materials composing the planets depends entirely on the degree of gravitation exercised in their deposition: the greater this is, the more solid or metalline must be the relative composition of their respective inhabitants. The matter deposited for the formation of the heavenly bodies is perfectly solid and crystalline in its nature. Sir Isaac Newton's opinion upon this essential quality of primitive matter has been already quoted, and in addition to the before mentioned passages we find the following in that philosopher's works. "While the primitive and solid particles of matter continue *entire*, they may compose bodies of one and the same nature and texture in all ages; but,

should they wear away or break in pieces, the nature of things depending upon them would be changed. Water and earth, composed of old worn out particles, and fragments of particles, would not be of the same nature and texture now, with water and earth composed of entire particles at the beginning; and therefore, that nature may be lasting, the *changes of corporeal things* are to be placed only in the various *separations*, and new *associations* and *motions* of these *permanent particles; compound* bodies being apt to break, not in the midst of solid particles, but where these particles are *laid together, and touch in a few points*." Celestial matter is simple, terrestrial, compounded, which accounts for the variety of combinations of matter developed at our planet; all changes being governed by the one primary law, gravitation; and the consequent law of attraction or crystallization. "If we are to reason at all, we can reason only upon the principle that for every effect there must exist a corresponding *cause;* or, in other words, that there is an established and invariable order or sequence among the changes which take place in the universe."* Gravitation is, in this process, the cause; crystallization, the effect. "In all its varied changes, the form of the law determines in what manner the fact shall take place; the mag-

* Dr. Roget.

nitude determines how *fast*, how *far*, how *soon*. The one draws the plan, the other gives the scale. If either were wrong, the result would be wrong."*

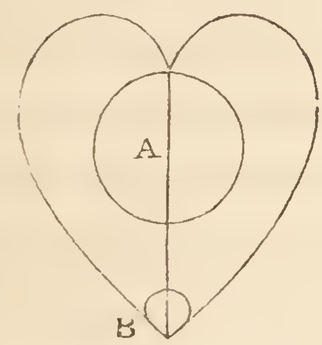
Every particle of matter sent off from the sun's body is impressed with the same laws which have regulated him; for the same principle of life which exists in the universe at large, is to be identified in its most minute point: thus the planetary body exists successively in the three stages of animal life, which are the oval, the fœtal, and the locomotive. Now, the power of matter arises from accumulation of its particles, and its changes are caused by condensation. By these means, at a certain period, the planet must have changed to the fœtal or fluid state of existence. The pressure occasioned by the continued absorption of matter by the planetary ovum, must have eventually produced friction or electricity in its centre. "Two pieces of ice being rubbed together, heat enough is produced to melt them."† Thus the hitherto solid and inert mass would acquire fluidity: every particle of fluid terrestrial matter creates its own aërial or elastic boundary, and thus the planet would assume the threefold division presented by the earth in the several forms of matter in the mineral, vegetable, and animal kingdoms.‡

* Whewell. † Thomson.

‡ All matter by changing from a solid to a fluid state becomes organized.

With the perfection of these three forms of matter, the fluid or active life commences; it is, however, more than probable that the duration of the oval existence of the planets depends in a great measure upon the formation of the next organ beneath upon the line of gravity.

1.



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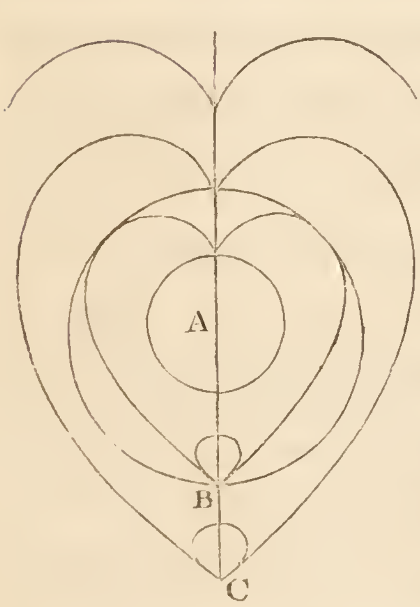


Let us consider B, diagram 1, the planet Mercury, deposited from the sun, point A. Until a planet was formed beneath, it is clear that Mercury would have no atmosphere in which to revolve upon his orbit, because three portions of that orbit, (see diagram 2,) must have extended beyond the sphere of the universal fœtus. When, however, Venus was formed beyond it, (in C, diagram 2,) the objection being removed, Mercury would acquire the necessary sphere of action. Another strong argument in favour of this supposition may be found in the circumstance that the concussion of two particles, in the foundation of a planet, produces an electric spark. This spark may be called, the lamp of life: it is continually elicited in the point of attraction, the North Pole; and its effect when produced in point C, diagram 2, would

be that of charging the planet B with electricity.* For a definite period this process would continue, when the latter, becoming perfectly charged, would commence its active life by removing from its position on the line of gravity, leaving free passage for the electric fluid to circulate through the line up to the sun's body, and allowing the planet C in its turn to experience the genial influence of the parent stem. This continuous stream of fluid electricity, is incessantly working its way upwards, forming a complete current through the very heart or centre of the universe.† The planet's motion on its orbit commences, in fact, in precisely the same way that the ball rises in the steam apparatus described in the subjoined note;‡ the

* A body heated to a certain degree becomes self-luminous.

Brande.

† "According to a curious memorial, published by Professor Olmsted, it appears that a meteoric cloud of numerous flitting stars circulates round the sun like a planet, and comes very near the earth at that point of its orbit which corresponds with November. The central point of this mass of luminous bodies is fixed by the American astronomers in the constellation of Leo."

Morning Chronicle, Nov. 11, 1836.

‡ "*Improvement in Steam Engines.*—We have received from the inventor, Mr. Joseph Price, a drawing and description of his improved Steam Chest and Safety Valve. Instead of the common valve, there is placed on the top of the steam-chest a cup, with an aperture for the steam to escape. In this cup a loose brass ball (weighted to the pressure the boiler can bear) is placed. When the steam rises above that pressure, the ball also rises, and allows the steam to escape through the waste-pipe. There is an elbow-pipe connected with the steam-chest below the ball-seat, which also enters the waste-pipe. In

peculiar swiftness being dependent upon the quantity of heat absorbed from beneath, which overcomes the pressure that had hitherto kept its body in a state of rest.

Whewell observes, "the sun might become, we will suppose, the centre of the motions of the planets by mere mechanical causes; but what caused the centre of their motions to be also the source of those vivifying influences? Allowing that no interposition was necessary to regulate the revolutions of the system, yet observe what a peculiar arrangement in other respects was necessary, in order that these revolutions might produce days and seasons. The machine will move of itself, we may grant; but who constructed the machine, so that its movements might answer the purposes of life? How was the candle placed upon the candlestick? How was the fire deposited upon the hearth, so that the comfort and well-being of the family might be secured? Did these, too, fall into their

this is a handled valve, by which the engineer can blow off his steam or regulate it. If the ball cannot be weighted by the engineer so soon as the steam rises above the safety pressure, it escapes, and when sufficiently blown off, the ball returns to its seat. By this ingenious contrivance, which has been in operation for seven years, the fatal accidents which so often occur are effectually prevented."

Morning Chronicle, Oct. 29, 1835.

Archimedes said, with apparent, but only apparent, extravagance, "Give me a place to stand upon, and I will move the earth!" This place is the point in which the next planet beyond the earth passed it's solid or oval life; and, by that planet's force thence directed against the earth, its revolution round the sun commenced.

places by the casual operation of gravity? And if not, is there not here a clear evidence of intelligent design, of arrangement with a benevolent end?"

The centre of the planets, like that of the sun, is the seat of active life, and in both it is occasioned by pressure. When the planets are removed from their position upon the line of gravity, they carry away with them a portion of it in their own bodies on which they revolve. This subtracted part of the natural magnet forming their axis, is as perfect in its properties as the whole:* it has the same powers of attraction and repulsion, electricity and magnetism: it has, in short, become a North and South Pole of the planet, by the properties of which that body is retained in its orbit, and having completed its revolution around the sun, naturally returns to its old position.

> "These various orbs behold, in various speed,
> Pursue the journeys at their birth decreed;
> Now, from the centre, far impell'd, they fly,
> Now, nearer earth, they sail a lower sky,
> A shorten'd course. Such are the laws imprest
> By God's dread will, that will for ever best."
>
> *Mickle.*

"Since the earth moves with the greatest velocity in that part of its orbit nearest the sun, it must complete its journey through one-half of its orbit

* See page 21 of this chapter.

in a shorter time than through the other half; and, in fact, it is about seven days longer performing its summer half of its orbit, than its winter half."* The sun being the source of all motion, light, and heat, it is obvious that the course of the planets must be regulated by him. The winter, or freezing point, is the place whence they all start upon entering into the active or fœtal life. The summer quarter is the exact reverse of this at the opposite end of the line, the galvanic; ascending in its orbit, the planet has to pass in the summer over the direct mouth or heart of the sun, encountering the full stream of his rays perpendicularly directed to its body. In passing round the orbit, the planet endures every change of temperature from extreme heat to extreme cold, according to its change of position, as regards the sun's body, (or rather the qualities of the matter it encounters thence, in each successive situation.)† The planet, in its circuitous

* Library of Useful Knowledge.

† "Besides the motions which we observe in all these planets, their apparent magnitudes are very different at different times. Every person must have observed that Venus, though she constantly appears with great splendor, is not always equally big; and this apparent difference of magnitude is so remarkable, that she appears no less than thirty-two times larger at some seasons than at others. This increase of magnitude is likewise very remarkable in Mars and Jupiter, but less so in Saturn and Mercury."—*Ency Brit.* There can be no doubt that the planets all expand and contract as they change their position with regard to the sun. Thus Venus, whose body in comparison to the sun is as one to eight in the freezing point, would be four times that size when situated in the boiling point over the mouth of the universal heart.

progress around the sun, purifies that luminary of its old materials,—by the absorption of which, it increases in growth, and in turn acquires power to purify itself. Thus the ascending body acquires bulk by the addition of fresh materials, until having reached the extreme point of its orbit it is forced to descend, still continuing to absorb, and to radiate in proportion to its newly acquired strength, till it is finally deposited in the electric point whence it first started. The effect of this process upon the line of universal gravitation is that of elongation, which is caused, in the galvanic point, by the planet's struggle to ascend; in the electric, by a proportionate effort of that body to descend, from increased weight. Thus the whole mass of the universe grows, or bulges outwards, with the extension of its fundamental line. The spring, or ascending portion of the solar system, answers to the right hand of the celestial fœtus, the descending portion to the left.* The lines formed by the sun in depositing his materials at the freezing point are cordiform† and distinct from those formed

* "Heaven hath the threefold difference of position, upwards and downwards, backwards, and right and left, for these are proper to all animate things which have the principle of motion within themselves. The right side of heaven is the east, for thence begins its motion; the left side, the west; and consequently the *arctic pole is lowermost, the antarctic uppermost.*" Such was the opinion of Aristotle.—*Stanley.*

† "Though we have thus described the motions of the planets with respect to their apparent distances from the sun, they by no means

by the planets in moving upon their orbits. The former are descending vessels and veins of the fœtus,—the latter, which are oval, and enclose the others, are the arteries. Each planet has this double set of vessels, by which it is connected in the magnetic and electric points with the universal line, and, consequently, with the heart, through which that line passes.* The sun ejects matter in a positively electric state for the support of the various organs within his sphere, and a proportionate quantity is returned to him in exchange in a negative condition. "The currents of positive

appear to us to move regularly in the Heavens, but, on the contrary, in the most complex and confused manner that can be imagined, sometimes going *forward*, sometimes *backward*, and sometimes seeming to be *stationary*. They all seem to describe looped curves, but it is not known when any of these curves would return into themselves, except that of Venus, which returns into itself every *eighth* year. On each side of the loops they appear stationary; in that part of each loop near the earth, retrograde; and in every other part of their path, direct."—*Ency. Britannica.*

* Between these two points the sun's matter is constantly ascending and descending throughout the whole universe. "In man, who is called a *microcosm*, or world in miniature, there is as incessant a return of the blood to the heart in a negative state by one set of vessels, as there is an issue of it in a positive state by another. The lungs also inspire the air in one state, and expire it in another; and by this alternate flux and reflux, life is maintained; but suspend it beyond a certain period, and death is the result. Again, the rivers are constantly discharging their waters into the sea by one channel and receiving them back again by another. Plants, likewise, and animals, derive their nutriment from the earth and from the Heavens, and under other forms return it again to the sources from which it flowed. So that it seems to be a general law, that where there is an afflux there must also be an influx."—*Kirby.*

electricity set from the centre to the circumference, and the negative from the circumference to the centre, and *vice versa*, according to the position of the magnetic poles, and the direction of rotation."* By this efflux and influx the sun and planets increase in growth and strength. What is given off from the sun in quantity is always repelled back in quality; the distance of each planet from the sun being determined by the increased power of the matter employed by him in its formation,† and each fresh organ being a multiplication of strength to the heart. "M. Haüy conceives the phenomena both of magnetism and electricity, to be produced by the simultaneous action of two distinct fluids."‡ "The anatomist has examined the living body, and has there observed, that all motion proceeds immediately from the muscular fibre :|| that the muscular fibre again derives its power from the nerves which terminate

* Mrs. Somerville.

† "All the master planets move about the sun at several distances, as their common centre, and with different velocities. This common law being observed in all of them, that the squares of the times of the revolutions are proportional to the cubes of their distances."—*Grew.*

‡ Mason Good.

|| "The simple, or elementary fibre, about which so much has been written, may be considered as the philosopher's stone of physiologists. In vain, has Haller himself, in his pursuit of his chimera, told us, that the elementary fibre is to the physiology what the line is to the geometer, and that as all figures are formed from the latter, so are all the tissues formed from this fibre."

Richerand's Elements of Physiology.

in the brain; that fibre, and nerve, and the whole system are nourished by the blood that comes from the heart, and that the waste of blood is supplied by the lacteals which absorb nutritious matter from the food as it passes along the intestinal canal."

> "All, all is action: the vast whole alike
> Moves in each part; and from material seeds
> Draws, undiminished, its eternal food."
>
> *Mason Good's Lucretius.*

Each of these planetary bodies is a little sun within itself; once awakened from its oval or crystalline state, it will produce and reproduce, ad infinitum.* The greater the distance of the planet from the sun, the source of heat and light, the greater we find the powers of condensation, attraction, and repulsion bestowed upon it; by these natural means it is enabled to form for itself moons, belts, &c. to direct its course through the heavens. The moons belonging to these planets have been projected from their respective bodies in the same way that they were themselves, in the first instance, from the sun.† They are governed by the same

* "It is contended by Dr. Darwin, and other writers on vegetable physiology, that each annual shoot should be regarded as a collection of individual buds, each bud being a distinct individual plant, and the whole tree an aggregation of such individuals."—*Dr. Roget.*

† "The Great Creator of the universe has exercised in its construction the severest and most refined geometry, has traced with unerring precision the boundaries of all its parts, and has prescribed to each element and each power, its respective sphere and limit."—*Dr. Roget.*

laws, and compelled, like them, to pass through three stages of existence, of which the present is the fœtal, or fluid, in which they revolve round their primary, circulate with it round the sun's body, and experience the influence of the universal temperature, i. e. the changes of the seasons.

The third life of the planets has not yet arrived. It will commence when the sun becomes perfected in his fœtal state of existence; the whole mass will then undergo a change to the aeriform state, as one celestial organized being.

We have now described the first two forms of matter presented to us by the universe in its present state.

The third species of matter in the celestial fœtus is aeriform, and it encloses the two former; the solid and fluid portions of the fœtus are contained in or encircled by an aeriform boundary, or skin, in which is situated the Zodiac, an imaginary belt, or zone, so called from the Greek word zoon, an animal, and zoe, life.

This belt is sixteen degrees in width, and is divided into twelve parts, each containing 30°, making in all, 360°, which is the measure of the circumference of the fœtus. If lines be drawn from each of these degrees in the boundary to the sun's centre, the orbits of the several planets will be divided in a similar manner; and the gravitating line, which passes through the centre of the fœtus, (uniting its

two extreme ends in the points of galvanism and electricity), will be common to the several enclosed masses, measuring 180° in each respective sphere: in like manner all animal bodies may be conceived with reference to their relative sizes, to have a diameter of 180 parts and a circumference of 360.

Each of the twelve zodiacal signs has been, by astronomers, named after some imaginary figure.* That part of the aeriform mass not occupied by the Zodiac is called the Galaxy, or milky way, thus described by Milton.

> "A broad and ample road, whose dust is gold,
> And pavement stars, as stars to thee appear,
> Seen in the Galaxy, that milky way,
> Which nightly as a circling zone thou seest
> Powdered with stars."

Keith says that the Via Lactea is a "whitish luminous track, which seems to encompass the heavens like a girdle of considerable, though unequal breadth, varying from about four to twenty degrees. It is composed of an infinite number of small stars, which, by their great light, occasion that confused

* "The Chaldæans divided the zone into twelve parts, and to each of them assigned a particular figure, signifying some one of their gods, whom they believed to be twelve in number. God made use of a dodecahedron in the construction of the universe, whence there are twelve figures of living creatures in the Zodiac, whereof each is divided into thirty parts. Likewise, in a dodecahedron, which consisteth of twelve pentagons, if each be divided into five triangles, there are in every one six angles, so that in the whole dodecahedron, there will be 360 triangles, as many as there are degrees in the Zodiac."—*Plato. See Stanley's Lives of the Philosophers.*

whiteness which we perceive in a clear night, when the moon does not shine very bright."* This aeriform portion of the universe must inevitably

* "A very remarkable appearance in the Heavens is that called the *Galaxy*, or *milky-way*. This is a broad circle, sometimes double, but for the most part single, surrounding the whole celestial concave. It is of a whitish colour, somewhat resembling a faint aurora borealis; but Mr. Brydone, in his journey to the top of Mount Ætna, found that phenomenon to make a glorious appearance, being, as he expresses it, like a pure flame that shot across the Heavens."

Ency. Britannica.

"*Falling Stars.*—In the *Scotsman* of the 29th of July, 1835, we gave an account of an extraordinary fall of meteors over a space of a thousand miles in North America, on the 13th of November, 1833. A similar phenomenon was observed in 1831; again in 1832 in Ohio, and at Orenburg, in Russia; by Humboldt also in 1799; and all about the same period, namely, the middle of November. In 1833 the shower of meteors continued the whole night; and it was observed that they seemed to radiate from one point. This point did not shift with the change of the earth's position on its axis, but followed the apparent motion of the stars; in other words, it continued fixed in one part of the Heavens (in *gamma* Leonis.) Their height from the earth was estimated at 2,000 miles. From these and other facts Professor Olmsted, of Yale College, concluded that the falling stars were portions of a *nebula* or body of fine combustible vapour, probably like the tail of a comet, revolving round the sun in six months, which portions were detached from the rest by the earth's attraction, and falling with immense rapidity, took fire when they reached our atmosphere. The subject has not escaped the attention of M. Arago, whose profound knowledge of physics entitles his opinion to great weight. He has adverted to it in a paper, of which we have a translation in the *Edinburgh Philosophical Journal* for July. He mentions observations made in France, in November, 1835, confirmatory of the periodical occurrence of the meteors; rejects the idea of their originating within the atmosphere; and, alluding to the grand display of them in America in 1833, says—'It is scarcely possible at present to see any other mode of explaining the astonishing appearance of these bodies than by supposing that, besides the large planets, there move round the sun myriads of small bodies, which are not visible

vary in width: the coldest end of the fœtus (the electric) being contracted into narrow limits, while the warmest (or galvanic) is proportionably expanded. All the luminous bodies contained in this aeriform skin or coating of the fœtus have been deposited by the sun in the nebulous form (which is oval), and, being aeriform, must be perfected in three successive stages of existence, prior to the change of the whole fœtus to its third or locomotive state of existence.

except when they penetrate into our atmosphere, and there become inflamed; that some of these *asteroids* move in a certain sense in groups, and that others are insulated.' Again he says—'All these facts tend more and more to confirm us in the belief that there exists *a zone composed of millions of small bodies*, whose orbits meet the plane of the ecliptic towards the point which the earth occupies every year from the 11th to the 13th of November. *It is a new planetary world just beginning to be revealed to us.*' M. Arago's idea is, that millions of globules, or small parcels of nebulous matter, circulate round the sun in a *vortex* or whirlpool, which crosses the earth's path about the middle of November; and some of these, drawn from their course by the earth's attraction, take fire when they reach the atmosphere, and assume the form of shooting stars. He suggests that they should be looked for at the opposite point of the ecliptic about the end of April, and alludes to an observation of Messier, who saw, in June, 1777, at mid-day, 'a prodigious number of black globules pass across the sun for about five minutes.' Might not these be asteroids? This hypothesis explains the facts better than Professor Olmsted's; for we may suppose millions of these small nebulous bodies revolving at all distances and angles round the sun, but distributed unequally; some moving singly, some in groups, or circular trains, and coming in contact with the earth at any point of its orbit, less or more frequently, less or more abundant in that part of space through which it is moving at the time. We would thus account for the occasional appearance of falling stars at all seasons of the year."

Scotsman.

CHAP. III.

MATTER.

"What forms the mass,
Term'd by the learned, Matter, seeds of things,
And generative atoms;
Atoms *primordial*, as hence all proceeds."
Mason Good's Lucretius.

All matter composing this universe is diamond; but that material varies according to combustion. At the point of extreme heat* it is in a perfectly elastic, pure, and simple state; at the freezing point it becomes condensed or crystallized into what we term *Iron*. Now, all enquirers into the origin of matter have, by common consent, traced it to hydrogen and oxygen. I shall go a step farther, and assert that diamond is the base of hydrogen: iron that of oxygen. Hydrogen being matter in the point of extreme heat, oxygen being the same material in its most condensed state at the freezing point. These two gases, when combined, constitute *water*, which is our gravitating element. We shall, accordingly, find that the particles of matter deposited by the sun at our planet are, in fact,

* We are speaking of the *universal* temperature.

composed of diamond or hydrogen, and iron or oxygen, accompanied always by a certain proportion of *carbon* (or diamond in a cinereal state), all which are to be traced to the simple diamond.

In order to identify these materials, it is necessary to give a distinct account of their several properties and qualities; I shall therefore subjoin the most remarkable facts, adduced by writers of celebrity, respecting each of them, beginning with the all-comprehensive diamond.

"*Diamond*, *adamas* of the ancients, *almas* of Persia, and *heera* of Hindostan, is the most brilliant of gems;* and, although known from the remotest times, if we may judge from the casual notice made of it in Scripture, it had, in the earlier periods of history, obtained little more than a name. Pliny states that it bore a price above all things in the world, and was known to very few, except princes and crowned heads.† "It does not appear that the diamond has ever yet been seen in a matrix, which could be esteemed its *original* position."‡

* *Diamond*, (German, *du*, *da*, and Fr. *la Diamant;* Ital., Sp., and Port., *Diamante;* Russ., *Almas;* Pol., *Dyamant;* Lat., *Adamas;* Hind., *Hira;*) a precious stone, which has been known from the remotest ages.—*Mac Culloch's Dict. of Commerce.*

† *Encyclopædia Britannica:* "The Diamant carieth the greatest price, not onely among precious stones, but also above all things else in the world; neither was it knowne for a long time what a Diamant was, unlesse it were by some kings and princes, and those but very few."—*Pliny.*

‡ Encyclopædia Britannica.

"In the places where this gem is found, it appears quite out of its natural situation; nor has it yet been discovered in what substance it was originally formed."* "The gem is confined within the limits of the tropics;"† but the principal mines are in India and Brazil.

In the former country, we learn from Heyne, that the seven villages near which the diamond mines were found, all belonged formerly to a powerful Zemindar, named Opparow; but, for the last eight years, the Mizam has taken them under his own management. The following account is given by him of the discovery of this subterranean treasure:

"It is said that, about a century ago, some mountaineers found, at the foot of a hill, *after a shower of rain*, some large stones, which proved to be diamonds of inestimable value. Opparow, becoming acquainted with this discovery, immediately set people to work upon the hill, who found a prodigious number of very large diamonds. The news of this acquisition soon reached the Mizam, who was the sovereign. He despatched his peons, and took possession of the villages. Since that time persons authorized by him are alone entitled to search here for diamonds. Being unacquainted with the nature of the different treaties which have been ratified

* Mawe's Treatise on Diamonds.

† Encyclopædia Britannica.

since that period, I cannot inform my readers how it came to pass that, even after the English East India Company got possession of the Circar, these villages were retained by the Mizam, though all the rest of the country on this side of the Kistnah was ceded. Tradition says that as soon as Opparow was obliged to give up his mines, large stones ceased to be found, and that the size of the diamonds extracted from the earth never exceeded that of a horse-gram, or chick-pea, though before that period they were as large as common flints.

"The traditional account of the discovery of the diamond mine at Codavetty Kallu, one of these seven villages, is as follows: A shepherd one day found, *near a ravine* in the neighbourhood, some stones, which appeared to him serviceable flints. He picked up several, and used them accordingly. Some time after, the poor fellow, while at the residence of Opparow, took, in an unlucky moment, one of these stones out of his pocket, and employed it to strike a light to kindle his tobacco. The stone was observed by one of the rajah's *lambadies*,* who, knowing its value, made enquiry how it had come into the possession of the shepherd. The good man heedlessly related all that he knew. He was conducted to the rajah, who easily prevailed upon him to point out this unknown residence of Stree Latchmie, the goddess of riches. The rajah

* Slaves.

was on this occasion so condescending as to go himself to the spot, and was not a little surprised at the riches which the goddess had reserved for him. Penetrated with grateful sentiment to the invisible harbinger of his good fortune, and to he genius of the place, he immediately ordered an offering to be brought, which, for more than one reason, consisted of the head and blood of the poor shepherd. His wife and children being found, upon examination, entirely ignorant of the discovery, were spared, and taken care of by the rajah, as long as the mines belonged to him. Bullock loads of diamonds were found, it is said, near that nullah, until at length the Mizam, being apprized of the discovery, claimed the ground as his own, and deprived the Zemindar of it for ever. But he had been so industrious, during the short time that the mines were in his possession, that all the large gems were removed, and the Mizam was able to obtain only small diamonds of comparatively inconsiderable value.

"I have very little doubt that the foundation of this account is correct, though it may very well be asked what is become of the bullock-loads of diamonds? for at present the family of Opparow is rather poor and dependant, and resident at Ellore."*

* Heyne's Tracts on India.

"There is a diamond mine of Soumelpour, or river Goual. Soumelpour is a large town, built all of earth, and covered with bunches of cacao-trees; the river Goual runs by the foot thereof, in its passing from the high mountains towards the south to the Ganges, where it loses its name. It is from this river that all our fine diamond points, or sparks, called *natural sparks*, are brought. They never begin to seek for diamonds in this river till after the great rains are over, that is, after the month of December; and they usually even wait till the water is grown clear, which is not before January. A great sign that there are diamonds in it is the finding of those stones which the Europeans call *thunder-stones*."*

"At Banaganpilly, the diamond-mines, as they are called, are scarcely anything but deep holes, open at top; sometimes, indeed, the work is carried on for some extent under the rock, which is then supported by stone pillars. None are deeper than *twenty feet*. The gallery under the rock is so low that the people are obliged to work in it sitting; a mode of working which an Indian prefers to any other. The solid rock of the hills (which, by the bye, is not destitute of diamonds,) is an aggregate, consisting chiefly of a coarse *grey hornstone*, with *rounded pebbles* of the same species, or of jasper.

* Encyclopædia Britannica.

At some depth this rock becomes a *ferruginous* sandstone, the grains of which are finely cemented together. Through this solid rock they are obliged to make their way, before they arrive at the bed in which the diamonds are usually found. They commence at different places, as their fancy leads them, with a spot about twenty feet square, which, by *iron* instruments and *steel* wedges, they break into slabs and fragments of from one hundred to five hundred pounds weight. In this way they sink to the diamond-bed, which is fifteen or twenty feet under the surface; this bed extends round the whole hill, and is as regular in its thickness and extent as the other unproductive beds in the same place; it consists of a conglomerate, composed of *rounded siliceous pebbles*, quartz, chalcedony, and jasper. The cement appears to be of the nature of clay or wacke, and is small in quantity; thus, it appears that *the diamond-bed is of the same nature with the rocks both above and below it; but it is distinguished from them by its superior hardness.* This bed is seldom more than a foot in thickness; and is intimately connected with the beds both above and below it, and frequently differs from them in nothing but the greater quantity of pebbles which it contains. It appears, from this description, that the diamond-bed here is a *solid rock,* whereas at Cuddapah, and other places, it is in a state of gravel.

"The mass containing the supposed diamonds is carefully cleared from the portions of the roof and floor of the mine that may be adhering to it; it is then carried to another spot of ground, where it is broken into pieces, and gradually reduced, by means of iron instruments, to the size of very small gravel. The process followed for separating the diamonds from the rubbish is almost the same as that observed in other places."*

"At Ovalumpilly the diamond-bed is found under a bed of red clay, about three feet thick; and many undoubted alluvial tracts in India are celebrated for the diamonds they afford.†"

Heynes, in his Tracts on India, says, "When I passed Chennūr, a village about twenty miles north from Nellore, I was informed that diamond-mines existed in its vicinity; and that not many years ago diamonds had been found there of the first water, or, as the Hindoos express it, *male diamonds*. The black soil, and the capacious layers of calcareous tuff below it, may be considered as indirect proofs of the veracity of this assertion."

Other mines where this gem is found are in the district of Serro do Frio, in Brazil. It is found in the same manner as the gold, in the gullies of torrents, and beds of rivers, or in yellow ferruginous earth, under rocks of quartz and sand-stone;‡ these mines are chiefly *scours* (as they are called),

* Jameson. † Ibid. ‡ Ibid.

on the surface of the earth. (Brazil borders to the west on desarts and forests, held by savages; while, in the interior, there are great chains of mountains, mingled with superb vallies, and large fertile plains.) Serro do Frio, or the *Cold Mountains*, produce not only diamonds, but are also very rich in mines of iron, antimony, zinc, tin, silver, and gold: the diamonds are supposed originally to exist in the mountains; but they are more easily found in a bed under the vegetable earth, disseminated and attached to a gangart more or less ferruginous and compact. They are also found in the soil of the mountains, in beds of ferruginous sand and pebbles (often loose, but sometimes forming an ochraceous pudding-stone), of the decomposition of *emery*,* and what is called *boggy iron ore*.† This gravel is termed *caschalo;* and underneath there is a

* Emery is made use of to cut the gems.

† "When a negro is so fortunate as to find a diamond of the weight of an octavo (17½ carats), much ceremony takes place: he is crowned with a wreath of flowers, and carried in procession to the administrator, who gives him his freedom by paying his owner for it. He also receives a present of new clothes; and is permitted to work on his own account. When a stone of eight or ten carats is found, the negro receives two new shirts, a complete new suit, with a hat and a handsome knife. For smaller stones of trivial amount proportionate premiums are given. During my stay at Tejuco a stone of 16½ carats was found: it was pleasing to see the anxious desire manifested by the officers that it might prove heavy enough to entitle the poor negro to his freedom; and when, on being delivered and weighed, it proved only a carat short of the requisite weight, all seemed to sympathize in his disappointment."—*Mawe's Treatise on Diamonds.*

schistus, somewhat arenaceous, and sometimes indurated ore of iron. In the caschalo is also found gold in grains."* "All the diamond-mines of Brazil are situated in mountains, which give source to many streams that flow north and south into the river Tocantin on one side, and the Parana on the other; those near the little river of Milhoverde, not far from Villa Nova do Principe, in the province of Serro do Frio, are in a S. L., according to La Cruz, 17°, about long. 44° W. from London. This singular substance is not certainly known to be produced in any other part of the world, except Hindoostan, and chiefly about the same latitude, 17° N. The river of San Francisco is remarkable for passing a considerable way underground, after it has attained a great size. The gravel in these mines (or scours) consists principally of quartz, mixed with *oxide of iron*,† and containing, besides the diamonds, blue, yellow, and white topazes, and grains of gold; and about six feet above the diamond-bed are frequently found little black garnets."‡

* Pinkerton.

† "Iron also accompanies gold and most other metals, *so that a theorist might argue that they are all modifications of* IRON. It is also remarkable that most of the metals are generally found together in the same mine. Buffon, Min. III. 260, says he is so far from placing entire confidence in Parmentier, Recr. Chim. I. 339, who pretends to have turned mercury into gold by the acid of tartar; but, p. 348, he says that gold and silver may be produced from *iron*, scorified with sulphur, refreshed with lead, and afterwards melted in a coppel."—*Pinkerton.*

‡ Jameson. Pinkerton.

"In the island of Borneo is also a high mountain, whence are brought quantities of rock-crystal, and among them are sometimes beautiful diamonds; but the natives do not know the difference.* Pliny observes, "the only stone it is that we find in mines of metal: very seldom it is, and thought a miracle to meet with a diamant in a vein of gold, and yet it seemeth as though it should grow no where but in gold." "To explain in a more particular manner the general locality of the diamond," Mawe says, "I will suppose a valley to be formed of mountains of granite; through which runs a rivulet, having on its margin gradually rising hillocks or plains, more or less distant from the base of the mountains. It is by analogy that the presence of the precious gem in such a situation is to be inferred; hence a little geological experience is highly necessary. Diamonds having been found in ravines, formed by such mountains, it is fair to presume that they may occur in others of a similar character."

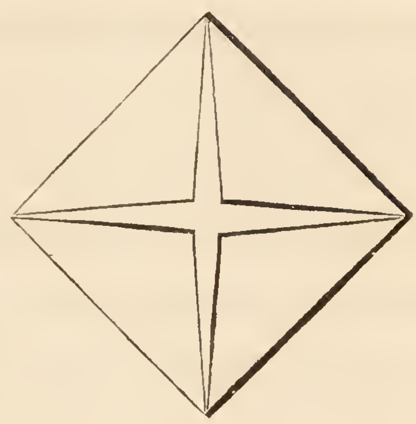
"The diamond occurs in rolled pieces, in indeterminate angular and spherical grains; also crystallized in the following figures.†

* "In the estates of the emperor of Borneo, in some pools, gold is found in lumps, sometimes weighing from ten to twenty pounds, and more; but the islanders are averse to draw it from the water, which is as *cold as ice*, and even do not touch the large pieces, which they idly regard as the matrices of the less."—*Pinkerton.*

"The word Sol, the Sun, was the name given to gold by the early chemists."—*See Hooper's Medical Dictionary.*

† "A very fine collection of crystallized diamonds is contained in the British Museum."—*Jameson.*

"1st. Regular octahedron, in which each plane or face is inclined on the adjacent, under 109° 28′ 16″. The faces are either straight or convex, and of these varieties the *convex or curvilinear are the most frequent. This is the fundamental figure, or that from which all the other may be derived,** (and is represented in the subjoined diagram.) When the planes of the octahedron become alternately smaller and larger, it passes into



"2dly. *A simple three-sided pyramid*, which is truncated on all the angles. Sometimes the apex is very deeply truncated; and then there remains only

"3dly. A segment of the octahedron. *Sometimes two of these segments are joined by their basis, and form a twin-crystal.*"†

The diagram in Chap. I. (page 8,) of this work is an octahedron with convex faces, in which each is divided into *six faces or planes*. In this figure the dividing edges run from the centre of each face; three to the angles, and three to the middle of the edges. The crystal consists of forty-eight equally curved faces, and has a rounded appearance. It is called by Haüy, "Diamant spheroidal sextuplé."‡

* Called by Haüy, le diamant primitif.

† Jameson.

‡ Ibid.—"The Indian is not engendered in mines of gold, but hath

In that diagram the form of an egg may be traced in every direction. That it is common for the diamond to be found crystallized as an egg, has been there mentioned with some very remarkable instances of the fact, and Pinkerton states that they are often found in Succedana of the size of a pigeon's egg. "The more common form is *round*, or *flatted as it were by attrition;* but its crystallization is the octahedron, or double quadrangular pyramid, and the dodecahedron, with their varieties, and sometimes it occurs in cubes."*

"At Banaganpilly the diamonds," according to Heyne, "are of an inconsiderable size, but usually in crystals; and I dare say they would be all found crystallized if another mode of extracting them were adopted. Those found in the earthy beds are mostly large, and less frequently of a regular form. This difference seems to depend upon the local situation. We may either suppose that the diamonds in the loose beds have been so long water-worn as to have been deprived of their angles, while those

a great affinitie with crystall, and groweth much after that manner; for, in transparent and clear colour, it differeth not at all, neither yet otherwhiles in the smooth sides and faces, which it carieth betweene six angles, pointed sharp at one end, in manner of a top; or else two contrarie waies lozenge-wise (a wonderful thing to consider), as if the flat ends of two tops were set and joined together: and for bignesse, it hath been knowne of the quantitie of an hazel-nut or filbard kernill."—*Pliny.*

* Jameson.

in the stony bed have not been subjected to so much attrition; or, if such an explanation be inadmissible, we must suppose that in one case the crystallization has taken place so slowly as to constitute regular figures, while in the other case it has been hurried and rapid, and has produced figures destitute of regularity. There is something in the crystallization of the diamond which distinguishes it from all other crystals; the faces are all curvilinear, while in *every other* species of mineral all *curves* seem to be constantly excluded. Are we to ascribe this difference to anything peculiar to the diamond itself, or to the slowness with which the crystallization was effected? At present we can have no accurate ideas on the subject, because we are not acquainted with any substance capable of holding carbon in solution, and, of course, cannot show the particular circumstances under which its crystallization took place. That some solvent of the diamond exists, we have every reason to believe, from the way in which that stone occurs; but it would be useless to speculate on the subject till that solvent shall be discovered."

"Le diamant au sortir de la mine est revêtu d'une croûte obscure et grossiere, qui laisse à peine appercevoir quelque transparence dans l'interieur de la pierre; de sortes que les meilleures connoissures ne peuvent pas juger de sa valeur, ainsi encrouté, on l'appelle '*diamant brut*.' "*

* Ency. ou Dict. Raisonné des Sciences.

"The surface of the grains is either rough, granulated, or uneven; that of the octahedrons generally smooth: in the dodecahedron, and other forms which originate from the truncation and bevelment of the edges of the octahedron, the surface is rough or streaked; and that of the twin-crystal is granulated. Externally, the smooth surface of the crystals is splendent; of the streaked, shining; and of the rough and granulated, glimmering. It is remarked that the greater number of diamonds with curved faces, have a dull surface."*

"La premiere opération de la taille du diamant, est celle par laquelle on le décroûte: mais cette matière est si dure, que l'on n'en connoît aucune autre qui puisse la diviser par le frottement, c'est à dire en terme d'art, qui puisse mordre dessus; en effet lorsqu' on frotte un diamant avec la meillure lime, on use la lime, tandis que le diamant reste dans son entier; la poussiere du grès, du caillou, du crystal, &c. est réduite sous le diamant en poudre impalpable sans y laisser la moindre impression; il a donc fallu opposer le *diamant* au *diamant* même pour le travailler. On les frottes les uns contre les autres pour les user, c'est ce qu'on appelle *égriser le diamans*. Lorsque le diamant est decroûté, on peut juger de sa transparence et de sa netteté."†

* Jameson.

† Encyclopedie ou Dictionnaire Raisonné des Sciences, des Arts, et des Metiers, par un Societé de gens de lettres.

"Dans toutes les mines dont il vient d'être fait mention, tant du

"Transparency and purity comprehend what is called the 'water of the diamond' by jewellers."* "It is seldom completely transparent; more generally it rather inclines to semi-transparent; but the black variety is nearly opaque. The most frequent colours of the diamond are the white and grey, and of these the most highly prized by the jeweller is the *snow-white*. A good diamond should be nearly completely transparent. *The colour should be perfectly crystalline, resembling a drop of clear spring-water,* in the middle of which you will perceive a strong light, playing with a great deal of spirit."† "It is found occasionally of a citron yellow, grey, brown, or black, but very rarely green or blue."‡ "*It often happens that a stone will appear of a reddish hue on the outward coat, not unlike the colour of rusty iron;* yet, by looking through it against the light, you may perceive the heart of the stone to be *white*, and if there be any *black spot or flaws,* or veins in it, they may be discovered by a

royame de Golconde que de celui de Visapour, les diamans sont cachés dans la terre, de façon qu'on en appercoit rarement en la creusant; il faut la tenir à la main. Dans la mine de Melwillée ils sont encroûtés de sable, et on ne peut les distinguer des graviers qu'après les avoir frottés contre une pierre."—*Ency. ou Dict. Raisonné.*

* Jameson.

† Jameson. "Diamonds are classed *first, second,* and *third water;* to apply any other epithet of their inferiority than 'flaw' to the 'king of gems,' would be derogatory to its dignity."—*Chambers's Journal.*

‡ Pinkerton.

true eye, although the coat of the stone be the same, and such stones are generally good and clear. All stones of a *milky* coat,* whether the coat be bright or dull, if never so little inclining to a bluish cast, are naturally soft, and in danger of being flawed in the cutting; and though they should have the good fortune to escape, yet they will prove dead and milky, and turn to no account."†

"Concerning the fouls and other imperfections that take from the value of the diamond, it is said, that all diaphonous stones are originally fluids, and spirituous distillations falling into proper cells of the earth, where they lie until they are ripened, and receive the hardness we generally find them of. Every drop forms an entire stone, contained in its proper bed without coats. While this petrific juice, or the matter which grows in the stone, is in its original tender nature, it is liable to all the accidents we find in it, and by which it is so often damaged; for if some little particles of sand or earth fall into the tender matter, it is locked up in it, and becomes a foul, black spot; and as this is bigger or less, so it diminishes the value of the stone. This, at least, is the mode in which fouls are accounted for. Holes are formed on the outside of the rough diamond, and must be occasioned by some hard particle of

* Lime-water is the test of carbonic acid, by turning it to a milky colour.

† Jameson.

sand falling into the tender substance of the stones, which not being heavy enough to sink into the middle, remains on the outside thereof, like a black spot, and, being picked off, leaves a round hole.*" "When examined with a microscope of great power, the texture sometimes consists of irregular fibres, but is generally laminated, or composed of *minute layers*, like the other genuine gems."† "Some of the pebbles, when broken, have a pellucid appearance; others exhibit arborizations, or dendritical figures."‡ "The diamond exhibits a most beautiful play of colours in the direct rays of the sun, or in candle-light, particularly when cut."|| "The value of the diamond is not derived solely from its transparency and lustre: its remarkable hardness is another and a most useful property belonging to it;§ for, in consequence of its great degree of hardness, it is capable of cutting and polishing not only the hardest glass, but even the hardest gems:** and if we consider how useful a

* Milburn's Oriental Commerce.

† Pinkerton.

‡ Heyne.

|| Jameson.

§ "It is, however, the most hard, transparent, and brilliant of minerals."—*Pinkerton.*

** "The ancients were unacquainted with the art of cutting the diamond, and hence they used it in its natural granular or crystallized state. Even in the middle ages, this art still remained unknown; for the four large diamonds that ornament the clasp of the imperial mantle of Charlemagne, and which is still preserved in Paris, are uncut octahedral crystals."—*Ency. Brit.*

substance glass is, how universally employed as a means of at the same time admitting light and excluding the air from the interior of our houses; but that, in consequence of its hardness and brittleness, it would with great difficulty be divided by any common mechanical instrument, so as accurately to fit the frames in which it is fixed for the above purposes, we at once see the value of a substance which easily and readily accomplishes that end. A small diamond, no larger than a mustard-seed, fixed in a convenient handle, enables the glazier to cut a plate of glass into pieces of any shape that he pleases: and the same instrument will serve his daily use for many successive years."* Pliny says, "the trial of these diamonds is upon a smith's anvil: for, strike as hard as you will with an hammer upon the point of a diamant, you shall see how it scorneth all blows, and rather than it will seem to relent, first flieth the hammer that smiteth, in pieces, and the very anvil itself underneath cleaveth in twain. Wonderful and unenarrable is the hardness of a diamant: besides it hath a nature to conquer the fury of fire, nay, you shall *never make it hot*, do what you can: for this untameable virtue that it hath, the Greeks have given it the name of *Adamas*."

The ancients considered it as the most unalterable of bodies, and made it the emblem of the immutability of the decrees of fate.

* Kidd, Bridgewater Treatises.

"Si figit adamantinos
Summis verticibus dira necessitas
Clavos."*

"Quelle est donc la nature du diamant? le principe de sa clarté, de sa transparence, est-il le même que celui de sa volatilité? comment concevoir cette volatilité dans le corps le plus inaltérable d'ailleurs qu'il y ait peut-être dans la nature! Qui l'auroit pensé que la pierre la plus solide, la plus dure, la plus brillante et la plus précieuse, soit aussi comme l'or, le plus precieux et le plus rare de tous les métaux, c'est à dire, qu'elle ait à elle son caractère distinct, séparé et tout-à-fait différent de celui des autres pierres; ainsi que l'or possede en seul, un genre de perfection, qui le distingue et le sépare de toutes les autres substances du même genre? On diroit que la nature a rompu presque toute analogie à leur égard; qu'elle a fait un saut, et qu'elle a mis une barriere impénétrable entre ces deux êtres et tous les corps qui paroissent leur ressembler davantage. L'un a résisté jusqu'ici à tous les menstrues, et échappe au feu par sa volatilité, tandis que l'autre brave les moyens humains par son inalterable fixité."†

"Diamonds deserve the chief regard of all jewels.

* Percy Anecdotes. In India, diamonds of great size "are never sold by the Rajahs, or persons of rank, but are preserved in families from generation to generation, with religious care."—*Mawe.*

† M. D'Arcet.

First, they are the best *repository of wealth;* inasmuch as they will lie in the smallest space of any, and are thereby the most portable, and best conveyance of treasure. Next, their *superlative hardness* secures them from all injury by wear; as nothing can make any impression on them, or prejudice their lustre, but their rubbing against each other. They can only be affected by fire, and that must be strong and lasting to do them much harm; and the injury they receive thereby arises chiefly from taking them too hastily from thence, whereby the immediate impression of the cold air may possibly produce flaws, &c. A moderate fire will only occasion a roughness on their surface, which may be repaired by new polishing."*

* "According to Henckel, Boyle was the first who did not content himself with shutting up the diamond in his treasury, but devoted it to the action of fire."—*M. D'Arcet.*

Some jewels, which were missing, were lately discovered in the following remarkable manner. A fire having been lighted in a grate, where these gems had been concealed by the thieves, the brilliant appearance of the diamonds, in the midst of the fire, immediately attracted attention, and they were, with many other valuable jewels, extricated thence, all being more or less injured, the diamonds alone excepted, which were sparkling ones of the first water, and were not in the slightest degree impaired by the action of the fire—a striking instance of the indestructible nature of that gem. "Moreover," observes Pliny, "as touching the concord and discord that is betweene things naturall, which the Greekes call sympathia and antipathia, (whereof I have so much written in all my bookes, and endeavoured to acquaint the readers therewith,) in nothing throughout the world may we observe the one and the other more evidently, than in the diamant: for this invincible minerall (against which neither fire nor steele, the two

"That rules may be given for the just valuing of diamonds, according to their increase in *size and weight*, is reasonable to suppose from this consideration: that nature has produced in times past, as well as it does at present, diamonds in the following manner; viz. a vast number of small ones, and *progressively* a less number of larger; and that they promiscuously inherit the same properties, and share alike of perfection and imperfection. The *principle or rule* is, that the proportional increase, or value of the diamond, is, as the *square*

most violent and puissant creatures of nature's making, have any power, but that it checketh and despiseth both the one and the other), is forced to yield the gantelet and give place unto the blood of a goat, this onely thing is the meanes to breake it in sunder, howbeit, care must be had, that the diamant is steeped therein whiles it is fresh drawn from the beast, before it be cold: and yet when you have made all the steeping you can, you must have many a blow at the diamant with hammer upon the anvill; for even then also, unlesse they be of excellent proofe and good indeed, it will put them to it, and break both the one and the other: but I would gladly know whose invention this might be, to soake the diamant in goat's blood; whose head devised it first, or rather by what chance was it found out and knowne? What conjecture should lead a man to make an experiment of such a singular and admirable secret, especially in a goat, the filthiest beast, one of them, in the whole world? Certes I must ascribe both this invention, and all such-like, to the might and beneficence together of the Divine powers: neither are we to argue and reason how and why nature hath done this or that? Sufficient it is that her will was so, and thus she would have it. But to come again to the diamant, when this proofe taketh effect to our mind, so that the diamant once crack, you shall see it break and crumble into so small pieces, that hardly the eie can discerne the one from the other. Well, lapidaries are very desirous of diamants, and seeke much after them; they set them into handles of yron, and by their means they will with facilitie cut into any thing, be it never so hard."

of their weight, whether rough or manufactured."—*Jefferies' Treatise on Diamonds.**

Mr. Leeuwenhoek describes (in the Phil. Transactions, Dec. 1709,) some experiments which he made upon rough diamonds. He says, "I procured a few small rough diamonds from a jeweller, some of which I placed before a microscope, and observed one of them more particularly; concerning which I concluded, that all those streaks or fibres which I saw in it, were nothing more than the several coagulations or augmentations it had received from time to time, and that in a very short space. Now, that the increase of diamonds is made in such an order and manner we may conclude, the rather because we are sure that the same thing happens in the coagulation of many salts. I have taken some of these particles several times, and laid them upon burning wood coals till they were red-hot, and in that condition thrown them into the water, to see whether they would burst to pieces; or whether there would be any separation of matter from them; but that never happening, I must conclude that there was no air, nor any moisture shut up within them. Now, as we find, that, in the dissolution of silver by aquafortis, some of the small silver particles are coagulated in crystals of the figure of diamonds; and that the sugar which is

* In the perfect manufacture of this gem, half the weight will be lost.—See *Jefferies.*

boiled to a syrup in order to make sugar-candy, is also coagulated into such particles; so we may likewise suppose, that at the time when the diamond particles coagulate, a great deal of the same matter whereof they are composed is in the air, but not to be perceived by our naked eye, nor the quantity thereof to be known till it is coagulated into a body: and who knows but if a shovel of that earth, out of which they dig diamonds, were brought over and carefully examined by a microscope, one might discover abundance of exact and complete little diamonds of an unspeakable smallness!

"I know that there are a great many people who are of opinion, that many things lying in the bowels of the earth, and especially diamonds, grow bigger and bigger, and that their increase is occasioned by subterraneous fires driving the damps up higher and higher, which damps, they say, are impregnated or loaden with mineral, crystalline, or adamantine particles. But I am not of that opinion, for if it were true that an adamantine matter were produced by the subterraneous fires driving up the damps, we must conclude, that that matter would be fluid, and then that fluid matter so driven up, would coagulate with the diamonds it met in its way, and make them greater; but if that were true, this adamantine matter so driven up, could not have the power to disperse the earth or sand with which the diamonds were surrounded, in order to its own accretion or

coalition therewith, but this coagulating adamantine matter would involve earth, sand, or whatever other particles lay in its way, by which means there would be no such thing as a clear and clean diamond digged out of the earth.

"I know that there are some rough diamonds in and about which there is an earthy matter, but that does not seem strange to me, because it happens, as I imagine, in the very coagulation of the diamonds, and when the parts thereof were soft.

"Among several hexangular pieces of rock-crystal, I have observed some whose sides appeared very smooth to the naked eye, and whose points did not at all resemble crystal, but rather a dark earth; which I conceive to be only occasioned by the neighbouring earth's insinuating itself into the points of the said crystal, at its first coagulation, and when it was soft.

"Let us now suppose a diamond lying in the earth, and growing continually greater, whose axis was the fourth part of an inch, or 150 hairs' breadth, and that such a diamond, in the space of ten years was so much encreased, that its axis, or the bigness of its body, was augmented on every side half a hair's breadth, and so proportionably every ten years; by consequence then, in the space of 3,000 years its axis would be 300 hairs' breadth greater, by which means the diamond would be twenty-seven times bigger than at first.

"Now, if we suppose that a diamond in the space of ten years does increase on all sides a hair's breadth, its axis would be two hairs' breadth, which in 3,000 years would be 750 hairs' breadth, and then the last-mentioned diamond would be 125 times bigger than the diamond whose axis was 150 hairs' breadth; now supposing a diamond whose axis was 150 hairs' breadth, and its weight seven carats, what a prodigious diamond would that be whose axis is 750 hairs' breadth, and where shall we find such a diamond?

"This gem, without any essential colour of its own, imbibes the strong solar ray, and reflects it with additional intensity, hardly yielding to the splendour of the meridian sun."*

"Though the same sun, with all diffusive rays,
Blush in the rose, and in the diamond blaze,
We prize the stronger effort of his pow'r,
And always set the gem above the flow'r."—*Pope.*

"A diamond," says Dr. Wall, "by an easy slight friction in the dark with any soft animal substance, as the finger, woollen, silk, &c. appears in its whole body to be luminous; nay, if you keep rubbing for a little while, and then expose it to the eye, 'twill remain so for some little time;† but if the sun be

* *Heyne.* Of the luminous property of the diamond Boyle gives a most interesting account in his Experiments on Colours, which however is too long to be introduced here.

† "The burning of diamonds is a term used among the jewellers

eighteen degrees below the horizon, if any one holds up a piece of baize or flannel stretched tight between both hands, at some distance from the eye, and another rubs the baize or flannel with a diamond swiftly and pretty hard on the other side of it, the light to the eye of him that holds it, seems much more pleasant and perfect than any other way I have yet tried. But what to me seems more surprising than all I have mentioned, is, that a diamond being exposed to the open air in view of the sky, gives almost the same light of itself without rubbing, as if rubbed in a dark room; and if in the open air you put your hand or any thing else a little over it, to *hinder its communication with the sky,* it *gives no light:* and I do assure you, I have tried all or most of the other precious stones, but could find no such phenomenon in any of them."*

for putting them into a fierce fire, as they frequently do, when they are fouled with brown or yellow, or the like; this always divests them of their colour, without doing them the least sensible injury. M. du Fay, having been informed of this common practice, formed a conjecture, that the difference of diamonds in their shining or not shining in the dark, was owing to it; and that either all those which had been burnt, or all those which had not, were those which alone shone in the dark. But this was found an erroneous conjecture: for two diamonds, one lucid in the dark, the other not, were both burnt, and afterwards both were found to retain the same properties they had before. It is not only the open sunshine, or open daylight, which gives to these diamonds the power of shining in the dark; they receive it in the same manner, even if laid under a glass, or plunged in water, or in milk."—*Ency. Britannica.*

* Experiments of the luminous qualities of Amber, Diamonds, and Gum Lac, by Dr. Wall, in a letter to Sir Hans Sloane.

"Since the time of Sir Isaac Newton, the diamond has been supposed to exceed every other body in its power of refracting and reflecting light, the index of refraction, according to that philosopher, being about 2,439. Dr. Brewster, however, has found, that both red-lead ore and orpiment exceed the diamond in their action upon light. The diamond has always been considered as a crystal which gives single refraction; and in whatever way the diamond is cut, it exhibits no direct marks of *two images*. Dr. Brewster, however, has found, that it possesses the property of depolarizing light; and it necessarily follows, from his theory of depolarization, that like many other bodies, it actually forms *two images*, which are polarized in an *opposite* manner, like those of all doubly reflecting crystals; but, in consequence of its possessing only one refracting power, these images can never be *separated and rendered visible*. The diamond polarizes light by reflexion at an angle of 68° 10′ according to experiment, and at an angle of 68° 2′ according to theory; and its dispersive power is 0,038, nearly the same as oil of olives, and very much below flint-glass."* "Nor is it among the least of the glories of this gem, that it gave occasion to that remarkable conjecture of Sir Jsaac Newton respecting its chemical nature. That philosopher having observed, that the

* Jameson.

refractive power of transparent substances is in general *proportional to their density;* but that, of substances of equal density, those which are combustible possess the refractive power in a higher degree than those which are not; concluded, from a comparison of the density and refractive powers of the diamond, that it contained an inflammable principle; which opinion was subsequently confirmed by direct experiment. It will be remembered by the chemical reader, that on the same ground he made the same conjecture with respect to water, and with the same success. And never, perhaps, did the eye of philosophy penetrate more unexpectedly the thick veil which is so often found to hide the real character of various forms of matter: for, imperishable as from its name the *adamant* was supposed to be, who would have antecedently expected that it might be dissipated into air by the process of combustion? And with respect to the other subject of his conjecture, if any principle was opposed to combustibility in the opinion of mankind, it was water—'Aquæ contrarius ignis.'"*

"Sir Isaac Newton, in his Optics, hinted that, from its very great refracting power, it might be an unctuous substance coagulated.† This philosopher predicted, from its rich and peculiar effusion of

* Kidd.

† Mawe, speaking of the diamond, says "their lustre and colour often resemble gum arabic."

light, that the diamond would prove an inflammable substance."* "This prediction has been recently fulfilled by numerous experiments; and it is now universally admitted by chemists that the diamond is only a very pure species of coal!!!" To Sir Humphrey Davy we owe the identification of this gem with charcoal, and the following account was given by him of this extraordinary substance: 'Its specific gravity is about 3.5; it does not conduct electricity.† When the diamond is heated in air, it consumes away; and if it be exposed to oxygen continuously ignited by a burning glass, or by other means, it acts upon the oxygen nearly in the same manner as charcoal. The volume of oxygen is not perceptibly changed, and it is found converted into carbonic acid. Mr. Lavoisier first determined that

* "Then what shall we say of that incredible power of generalization which has enabled some even to anticipate by ages the discovery of truths the furthest removed from ordinary apprehension, and the most savouring of improbability and fiction—not merely of a Claivaut conjecturing the existence of a seventh planet, and the position of its orbit, but of a Newton learnedly and sagaciously inferring, from the refraction of light, the *inflammable quality of the diamond*, the composition of apparently the simplest of the elements, and the opposite nature of the two ingredients, unknown for a century after, of which it is composed? Yet there is something more marvellous still, in the processes of thought by which such prodigies have been performed, and in the force of the mind itself, when it acts wholly without external aid, borrowing nothing whatever from matter, and relying on its own powers alone."—*Lord Brougham.*

† "Its specific gravity is 3.5. When rubbed, it becomes positively electric, even before it has been cut by the lapidary, which is *not* the case with any other gem."—*Thomson's Chemistry.*

carbonic acid was formed from diamond; and Messrs. Tennant, Allen, and Pepys, have demonstrated, by some refined experiments, that it produces about the same quantity as an equal weight of charcoal.* Hence, it has been concluded, that the diamond is pure carbon, differing from charcoal merely in the arrangement of its parts."† Dr. Kidd, in the Bridgewater Treatises, says, "It will naturally excite the surprise of those who are unacquainted

* "That diamond and carbon were the same, was proved by Lavoisier in 1772. He burnt five grains of diamond in a given weight of oxygen, and he found that he obtained the same result as when he burnt five grains of carbon in oxygen, and he was therefore led to conclude that the diamond was pure carbon, and although this experiment has been many times repeated, the result has always been the same; the inference is therefore irresistible, that charcoal and diamond, although differing in mechanical texture, are similar substances in their chemical nature."—*London Pharmacopœia.*

† Carbon, in various proportions, is a frequent ingredient in the animal, vegetable, and mineral kingdoms; therefore diamond must likewise belong to them all. Of this gem "there are two classes, Oriental and Occidental; the first, the finest and hardest, from the Eastern; the latter, inferior and softer, from the Western world. Many experiments have been made in dissolving both, and it has been substantially proved that a powerful burning lens, from *solar heat*, has accomplished it sooner than the heat of a furnace. A diamond, weighing thirty grains, exposed thirty seconds, lost its lustre, colour, and transparency, and became opaque white in five minutes; bubbles appeared on its surface: soon afterwards, it burst into pieces, which were dissipated, and the fragments remaining were crushed into fine powder by the pressure of the blade of a knife."—*Chambers.*

"The Greek and Roman potentates, as well as the subsequent monarchs of Europe, possessed many rare and valuable stones of the class named, not a trace of which remains at the present day. From this circumstance, it may be inferred that they were lost during times

with the chemical history of this substance, to learn that the purest diamond does not essentially differ from a particular variety of common coal, or from that mineral of which drawing pencils are made, and which is usually, though not with propriety, called *plumbago* and *black-lead:* yet nothing has been more clearly proved, than that equal weights of these several substances, if submitted to the process of combustion, will produce nearly equal quantities of carbonic acid gas; which has already been stated to be a chemical combination of definite proportions of carbon and oxygen; the diamond, which is the purest form of carbon, burning away without leaving any residuum; the other two leaving a very small proportion of ashes, in consequence of their containing foreign matter. And here we can hardly fail to notice a very remarkable instance of what may be called the economical provisions of nature. How rarely, and in what small quantities, are the diamond and plumbago found; and how abundantly does coal predominate in many parts of the world! The Borrodale mine of plumbago in

of pestilence, or those equally dire convulsions when the sword is the great slayer, and produces effects still more disastrous than the entombment of Pompeii and Herculaneum. Coins of all sorts, and of every date, are frequently found buried in the earth; and as we never hear of diamonds being recovered in the same accidental manner, they perhaps decompose after a certain time, from causes we can only guess at, in the absence of every thing like certain information."—*Ibid.*

Cumberland is the most considerable source of that substance throughout Europe; and the province of Golconda almost alone supplies the whole world with diamonds: and, probably, the accumulated weight of all the plumbago and of all the diamonds which have ever been derived from those and other sources, would not equal a hundredth part of the weight of coal which is daily quarried in Great Britain. Suppose now that the case had been reversed; and what would have been the consequence? Diamond and plumbago, though really combustible substances, yet from their slow combustibility could never have answered, in the place of coal, as a fuel for general purposes; and, on the other hand, without that large supply of coal which nature has provided, what would have become of the domestic comforts and commercial speculations of the greater part of Europe, during the last two centuries?"

Sir Humphrey Davy further observed, (in allusion to the identification of charcoal with the diamond,) "When it is considered, however, that charcoal is a *conductor* and diamond a *nonconductor* of electricity, and that their physical properties differ entirely, it is impossible to receive this conclusion without doubt. I found that diamond-powder, heated strongly with potassium, became blackened; and an effect was produced on the metal similar to that which the absorption of a *minute quantity of*

oxygen would occasion. This would lead to the suspicion *that there may be a little oxygen in diamond;* but new experiments are wanting to prove this, and the quantity, if any, must be very minute, which does not harmonize with the doctrine of definite proportions. If it should be ultimately found that the diamond is merely *pure carbon*, it will be an argument in favour of the varieties of elementary forms being produced by different aggregations or arrangements of particles of *the same matter*, for it is scarcely possible to fix upon bodies less analogous than lamp-black, and the most beautiful and perfect of the gems!!"

Many medicinal properties are ascribed to this gem. Pliny says, "It hath a property to frustrate the malicious effects of poison, and drive away those imaginations that set folke beside themselves, and to expel vain fears that trouble and possess the mind: which is the reason that some have called it *Anachites*:" "moreover," continues the same author, "there is such a natural enmity between diamants and loadstones, that if it be laid near to a piece of iron, it will not suffer it to be drawn away by the loadstone: nay, if the said loadstone be brought so near a piece of iron that it have caught hold thereof, the diamant, if it come in place, will cause it to leave the hold and let it go."

From the above circumstances, the following inferences may be drawn. Diamonds do fall in

a crystallized state to our earth, by their being sought at the time of great rains; and when found imbedded in the earth, from the circumstance of such beds being no more than twenty feet from the earth's surface. This is no more surprising than that masses of iron should fall from the heavens, (which is a fact clearly ascertained.) The resemblance of the balls of hornstone, &c. to such masses of iron, assists the supposition. The exact similarity of the diamond in its perfect state to a drop of clear spring water, its being a non-conductor of electricity at its freezing point, our earth; its inflammability, *single* refraction, polarization of light, indivisibility, (the primitive signification of an atom being *I-cut*,)* which is alone affected on itself by its own substance; its *hardness;* its egg-shape, purity, and power of expansion, furnish abundant proofs of its identity with that primitive celestial matter, which

> "Lives through all life, extends through all extent,
> Spreads undivided, operates unspent."—*Pope.*

"IRON exists in five different states, but in these it exhibits the greatest variety of any of the metals. It is found in the metallic state; in that of alloy with other metals; *in the state of oxide;* and combined with the *acids, forming salts.* Iron has only

* See Note (†), page 7, of this work.

been found native in insulated masses; one of which was discovered by Pallas in Siberia, and another, which was found in South America, long occupied the attention of philosophers, in speculations and discussions concerning their origin. This point remained unsettled, till the discovery of numerous other facts with regard to similar productions, which have proved, whatever may have been their origin or mode of formation, that these metallic masses have fallen from our atmosphere."*

"That solid masses fell from above, connected with the appearance of meteors, had been advanced as early as 500 years before the Christian era, by Anaxagoras;† and the same idea had been brought forward in a vague manner by other enquirers among the Greeks and Romans, and was revived in modern times; but, till 1802, it was regarded by the greater number of philosophers as a mere vulgar error, when Mr. Howard, by an accurate examination of the testimo-

* Lydiard on Metals, MS.

† Anaxagoras foretold "on what day a stone would fall from the sun, which happened in the day-time in a part of Thrace, at the river Ægos, which stone is at this day shown, about the bigness of a bean, of an *adust* colour, a comet also burning in those nights."

Stanley.

Thus does Hudibras allude to the opinion of the Greek philosopher:—

> "For Anaxagoras long agone,
> Saw hills as well as you, i' th' moon,
> And held *the sun was but a piece*
> *Of red-hot iron* as big as Greece!!!"

nies connected with events of this kind, and by a minute analysis of the substances said to have fallen in different parts of the globe, proved the authenticity of the circumstance, and shewed that these meteoric productions differed from any substances belonging to our earth; and since that period a number of these phenomena have occurred, and have been minutely recorded."*

"Dr. Wollaston first showed, that the forms in which native iron is disposed to break are those of the *regular octahedron*, and *tetrahedron, or rhomboid*, consisting of these forms combined. In a specimen possessed by this philosopher, the crystalline surfaces appear to have been the result of a *process of oxydation*, which has penetrated the mass to a considerable depth in the direction of its laminæ; but in the specimen which is in the possession of the Geological Society, the brilliant surfaces that have been occasioned by forcible separation from the original mass, exhibit also the same configurations as are usual in the fracture of *octahedral crystals, and are found in many simple metals.*

* Davy.—Ure enumerates as many as 217 instances of masses of iron falling from the heavens as meteorolites; and "the Siberian Tartars have still a tradition among them, that the masses of native iron, traced in their own country, fell from heaven."—*Mason Good.*

One of the ancient philosophers believed "that lightning distils from the æther; and that from this great heat of heaven, many things fall down which the clouds preserve a long time enclosed."

This spontaneous decomposition of the metal in the direction of its crystalline laminæ, is a new and valuable fact."*

"In the second of these states (when found in alloy with other metals) it is in very small proportions. It is also discovered combined with sulphur. This compound is sulphurate of iron, which is known to mineralogists by the name of pyrites, and is a frequent production among the ores of iron. Iron is likewise found combined with *carbon.* This compound, now distinguished by the name of *carburet of iron,* is the *black-lead* or *plumbago,*† which contains nine parts of carbon to one of iron. But the most ordinary state of iron is that of *oxide;* and in this condition it exhibits a great variety of forms. It is sometimes in irregular and insulated masses,‡ sometimes regularly crystallized, and dis-

* Ure.

† "Iron, in the state of a carburet, forms the *graphite* of Werner, (plumbago.) This mineral occurs in kidney-form lumps of various sizes."—*Hooper's Medical Dictionary.*

That the diamond and plumbago were identified by Sir H. Davy has already been stated. "Iron united to carbonic acid, exists in the sparry iron-ore."—*Dr. Hooper.*

‡ "There is a hill of solid iron situated in *Brazil,* on the left of the road from Queluz to Villa Rica, rather more than a league from the former place. Mr. Lucock describes it as 'one entire mass of iron, so perfectly free from any mixture of common soil as to produce no vegetable whatever, being covered with a coating of rust or oxyde of iron. The hill is so lofty and steep that its top was not discernible, but, from its most elevated part, nodules or corroded metal had rolled down, and had greatly embarrassed the progress of the traveller on

posed in veins."* The common magnetic *iron-stone* or *loadstone* belongs to this class; as does *specular iron ore*, and all the different ores called *hæmatites*, or *blood-stone*.†

"Common and granular magnetic iron-ores are distinguished from *specular iron-ore*, with which they are often confounded, by the colour of the streak, which is black, whereas that of specular

the road beneath. At the foot of the mountain the soil is red clay, mixed with ponderous brown rust. As we advanced, the metal seemed to become less pure, until after an extent of two leagues and a half it altogether vanished, and was succeeded by clayey land. I had often heard of this immense mass of metal, but none of the reports had presented an adequate picture of it to the imagination. The very core of the hill, as far as we could judge, appears to consist of vast blocks of iron in tables; and it is so singularly free from alloy, as to produce, when melted, twenty-five per cent. of pure metal.'"

The London, Edinburgh, and Dublin Literary Journal.

* Lydiard.—"The discovery of the iron and steel mines, as also the working in them, was the invention (as Hesiodus saith) of those in Crete, who were called Dactyli Idæi."—*Pliny.*

† Hooper's Med. Dictionary.—When exposed to the air, the surface of iron is soon tarnished, "and it is gradually changed into a brown or red powder, well known under the name of *rust*. This change takes place more rapidly if the atmosphere be moist. It is occasioned by the gradual combination of the iron with the oxygen of the atmosphere, for which it has a very strong affinity."

"The *peroxid* of iron may be formed by keeping iron-filings red-hot in an open vessel, and agitating them constantly till they are converted into a dark red powder. This oxide was formerly called *saffron of Mars*. Common rust of iron is merely this oxide combined with carbonic acid gas. The red oxide may be obtained also by exposing for a long time a diluted solution of iron in sulphuric acid to the atmosphere, and then dropping into it an alkali, by which the oxide is precipitated. This oxide, when pure, has a fine red colour, bordering on crimson."—*Thomson's Chemistry.*

iron-ore is cherry-red;* by being powerfully magnetic, whereas specular iron-ore is scarcely affected by the magnet; and the crystallizations of magnetic iron-stone are different from those of specular iron-ore. Werner was the first who observed that this species of iron-stone is not magnetic when at a depth in the earth, but that it acquires this property after exposure to the influence of the atmosphere."†

"The red iron-ore, or red hematite, is opaque:‡ the streak is always blood-red: it is hard, passing into semi-hard; brittle, and rather easily frangible. It occurs in every situation where the compact kind is found, and like it in veins, beds, and lying masses *(liegende stöcke)* that approach in magnitude to mountain masses, principally in primitive mountains, but also in transition and secondary mountains. The different kinds frequently occur together, both in beds and in veins: in veins, it is the compact and ochry that predominate; the hematite occurs principally in drusy cavities, the walls of which are incrusted with the scaly kind."||

"Iron combines with two proportions of sulphur,

* The colour of micaceous specular iron-ore is "iron-black, of different degrees of intensity; thin plates, or folia, when held between the eye and the light, appear blood-red."—*Jameson.*

† Jameson's Mineralogy.—"The name *hematite*, which is derived from the Greek *αἷμα, sanguis,* was given to this ore of iron from its red colour."—*Ibid.*

‡ Ibid. || Ibid.

and forms *protosulphuret* and *persulphuret* of iron, compounds which are easily distinguished among mineralogists by the names of magnetic pyrites and cubic pyrites. Protosulphuret of iron is not only attracted by the magnet, but may be itself converted into a magnet by the usual methods; but persulphuret is not in the least obedient to the magnet, neither is it susceptible of the magnetic virtues."*

The colour of the Reniform or Kidney-shaped brown clay iron-ore "is yellowish-brown, but it shews various degrees of intensity, even in the same specimen: externally, it is darker, approaching to blackish-brown; internally the colour is very light, and sometimes it includes an ochre-yellow kernel. It occurs massive, in irregular single balls, also in reniform, lenticular and elliptical forms, which are sometimes hollow. These forms are composed of concentric lamellar concretions, which often include a loose nodule. It occurs imbedded in iron-shot clay, in secondary rocks of different kinds, and also in loam and clay beds that lie over black coal."†

The Pisiform iron-ore, or Pea-ore, "occurs in small spherical round grains, which are not hollow, and these are composed of concentric curved lamellar concretions."‡

Meadow-ore, or conchoidal bog-iron-ore, belongs

* Thomson's Chemistry. † Jameson. ‡ Ibid.

to a very new formation. According to Werner, it is formed in the following manner:—"The water which flows into marshy places is impregnated with phosphoric acid, formed from decaying animal and vegetable matter, which enables it to dissolve the iron in the rocks over which it flows, or over which it stands. This water, having reached the lower points of the country, or being poured into hollows, becomes stagnant, and by degrees evaporates; the dissolved iron being accumulated in quantity by fresh additions of water, there follow *successive depositions*, which at first are yellowish, earthy, and of little consistence, and this is *morass-ore;* but, in course of time, they become harder, their colour passes to brown, and the *swamp-ore* is formed. After the water has completely evaporated, and the swamp is dried up, the swamp-ore becomes much harder, and at length passes into *meadow-ore*, which is already covered with soil and grass." "In some of the Swedish lakes, this ore is deposited so abundantly, that it is dredged up every twenty or thirty years."—*Vid. Swedenborg's Regnum Subterraneum.*

"Iron appears to be more abundant than magnesia earth; it forms a constituent part of numerous rocks and stones; to it they most frequently owe their colour; the earths, when pure, are white.*

* Cuvier. "Iron is found in every kind of rock."—*Bakewell.*

To the presence of iron, the increase of gravity in most stones may be attributed, if it much exceed 2.50, or they are much heavier than water in a proportion of 5 to 2, or 2½ to 1."* "The specific gravity of iron, according to Dr. Hooper, varies from 7.6 to 7.8." "With respect to the *colours* of precious stones, it is a fact now fairly established in chemistry, that *all of them* depend upon a solution of some peculiar metal in some peculiar acid; and that of the various metals, iron is more frequently employed by nature than any other."

"Iron has been found, not only in the blood of animals, but in the juices of plants which have been purposely guarded from the access of all bodies of which this metal has been supposed to constitute a component part."† It therefore belongs not only to the mineral but to the vegetable and animal kingdoms; the three divisions of matter in our planet, the earth.

"Iron is generally obtained from the ores in a

* "The presence of iron not only increases the weight, and darkens the colour of numerous rocks and stones, but is one principal means of their decomposition. For iron exists in stones in two states of oxygenation, as the black or the red oxyd. When the former is exposed to air and moisture, it absorbs a greater portion of oxygen, and is converted into a brown ochery incrustation, which peels off, and exposes a fresh surface of the stone to a similar process. A minute portion of oxyd of the metal called *manganese* is also found in some rocks and stones."—*Ibid.* "Iron sinks in water, and swims in quicksilver."—*Locke.*

† Mason Good.

state of oxyde, and this frequently mixed with clay. It must, therefore, be separated from these substances. This is accomplished by reducing the ore into small pieces, and mixing it with a flux composed of limestone and charcoal. It is then exposed to a very strong heat.* For this process,

* "The coal used in this process may here be mentioned. The bituminous coal of Monmouthshire requires from five to nine days to become thoroughly coked, whilst that about Merthyn takes only half, or less than half, of that time. The coal, when coked, has parted with all its *moisture*, tar, and *hydrogen-gas*, and a great part of its sulphur; and, according to its properties, is either of a dull jet-black, with the appearance of charcoal, or exhibits a *bright metallic* or *vitreous lustre*, with a porous texture. The more *carbonaceous* matter it contains, the *better!!* and those beds of coal are therefore the most esteemed which present in the fracture the dull, soft appearance of carbonized vegetable matter. Small pieces of coke may be occasionally selected from such a quality that can hardly be discriminated from charcoal, having that fibrous texture and peculiarity of lustre, by which it is characterized. Coke, indeed, may be considered only as a *substitute for charcoal* in the smelting of iron, and was formerly unknown as applicable to this purpose. Charcoal is at present in general use in Russia and Sweden, and indeed is now used at a few works in this country. *The iron produced from it is particularly* calculated for conversion into *steel*, but its high price and insufficient quantity would totally preclude its general use, even were it a much greater desideratim than it is."

Manufacture of Iron, Lib. of Useful Knowledge.

The Hot-Blast.—"The introduction into Scotland of the system of smelting iron by *heated air*, has produced extraordinary changes in the manufacture of that important metal. The reduction in the quantity of fuel required is said to be no less than 300 per cent.; *two tons of coals*, or a corresponding quantity of coke, now proving to be sufficient for the smelting of *one ton of iron*, which formerly required on an average about eight. This would rank amongst the greatest strides of modern art, were no objections to exist in the corresponding deterioration, for general purposes, of the quality of the iron so produced. The *hot-blast* has not yet been introduced into the iron districts of England, from

furnaces are constructed in such a way, that the heat can be raised to a very *high temperature.* The nature of this process is thus explained; the *carbon* of the *charcoal* combines with the *oxygen* of the *iron,* and forms *carbonic acid,* which is driven off in the state of gas. By the strong heat to which the *lime* and *clay* are subjected, they are *fused* together, and form a vitreous matter, which, being *lighter* than the *iron,* rises to the surface.* The iron also is in a state of fusion at

the supposition that the metal is rendered by it *brittle,* and devoid of that malleability which is one of the finest qualities of iron; that the saving of fuel is not equal to the decreased value of the metal so produced. We cannot offer an opinion on this important subject, but, perceiving in the very able account of the origin, operation, and consequences of the hot-blast, which has recently been published by a learned gentleman in Scotland, no allusion whatever to the quality of the iron produced, we think it important towards the English iron-masters, that an explanation of the subject should be afforded by our northern friends."—*Weekly Dispatch, Jan.* 31, 1836. Of this practice we shall have to speak more particularly hereafter.

* "The appearance of the cinder is constantly watched by the keeper, as an indication of the working of the furnace, and he can generally tell, with tolerable certainty, the quality of iron he is about to cast, by this criterion alone. If it is of a *whitish-grey colour,* with a fracture somewhat resembling *lime-stone,* and running freely from the furnace to a considerable distance, he augurs well of the furnace; the materials are then doing their duty, combining properly with each other, and leaving the whole of the iron in the hearth without loss; the furnace is making good iron, and to a good yield. At other times, the cinder will assume a *glassy* appearance, being very *tenacious and tough* whilst hot, and running down sluggishly. The colour is, perhaps, of a light blue, or dirty yellow, or sea-green. This shews the furnace to be working cold, driving slow, and probably not producing iron to so good a yield as in the former case. But the most unfavourable aspect observable in the cinder is a jet-

the bottom of the furnace. When the process is finished, a hole is opened, through which the fluid

black colour, both on the surface and in the fracture; the surface being rough and uneven, and the stream being broad, hot, and shallow. These symptoms are always accompanied by an unfavourable yield, as a portion of the iron combines with the clay and limestone in the furnace, and comes away in the state of a *black oxide* with the cinder, causing its dark colour. Theory would teach us that the most favourable aspect of the cinder would be that of a *perfect glass!!!* indicating neither the presence of iron by the black colour, nor the excess of the flux by the *stony opaque* appearance of the fracture. *But in practice, this precise point is found so difficult,* that the appearance of the cinder is always considered the most favourable when it is '*strong of the stone*,' as the workmen say."

Manufacture of Iron, Lib. of Useful Knowledge.

If this perfect glass could be obtained, it would be the *pure diamond*, that which chemical philosophers have so long endeavoured, but unsuccessfully, to achieve!!!

"According to the following extract from a letter addressed by M. Theodore Virlet to M. Arago, another labourer in the vast field of chemical science appears to be approaching to the same point as Mr. Cross, but by a different route.

"Who does not know how many great facts, perhaps among the most difficult to comprehend previously, have already been explained by the excellent researches of M. Becquerel in electrical chemistry, and the important labours of M. Fournet regarding the formation of veins? Numerous other facts, although not yet fully explained, have been brought forward, and admitted without dispute. For example, I have proved that the emery of Naxos comes from veins, and, consequently, had been formed, like the greater number of specular iron-ores, by means of volatilization and sublimation; yet the corundum and oxide of iron, the mixture of which constitutes emery, are not more volatile than the carbonate of magnesia, which forms the subject of dispute.

"Since our chemical knowledge, then, does not always enable us to explain the phenomena whose existence we can prove, does it follow that we ought to call them in question? Has nature no mode of acting which surpasses our knowledge? And could she not proceed for instance, by means of double chemical decomposition? On this

iron flows and is received into moulds. This is what is called *crude or cast-iron*, or, in the language of workmen, *pig-iron*.* In this state it

supposition, the phenomenon (*dolomisation*) will admit of easy explanation. It is well known that all the muriates are volatile, or at least susceptible of sublimation. Magnesia might then easily reach the state of a muriate, and occasion the formation of a soluble hydrochlorate of lime, which would be carried off by the infiltration of water; while the magnesia, on the contrary, would be combined with that portion of the carbonic acid set at liberty, and would thus serve to form the double carbonate of magnesia and of lime, which constitutes dolomite, properly so called. In this there is certainly nothing inadmissible or contrary to reason, inasmuch as the hydrochloric acid gas is one of the gases most frequently disengaged from volcanoes, and the muriates ought to have been disengaged more abundantly in former times, if we admit, with geologists of the modern school, that the immense deposits of rock-salt which exist in saliferous formations are deposited by volatilization, in the midst of the strata which they penetrate.

"I am therefore of opinion, that the modifications of rocks of the second class may henceforth be all explained by means of double decomposition—a process which has enabled one of my friends, M. Aimé, *to produce, in the laboratory, crystallized specular iron-ore, analogous to that of the island of Elba, as well as pure iron, equally well crystallized, a substance hitherto unknown to mineralogists:* whence I conclude, *that the time is not perhaps far distant, when we shall be able to produce, with ease, all the species of precious stones, without even excepting the diamond.*"

* There are six different sorts of pig-iron, all of which (did the limits of our work admit of their being detailed) illustrate our theory. "*White* iron is supposed to contain a very small portion of *carbon*—less than any other sort of pig-iron. It is totally unfit for casting, and is sometimes so thick, as hardly to run into the pig-moulds, although they are purposely made very large; and so *brittle*, that the largest and most unwieldy pigs may be readily broken by a blow with a sledge hammer. *It is too hard to yield in any degree to the chisel.* The colour of the fracture is a silvery white; shining and smooth in its texture, with a foliated or crystallized structure. All these six descriptions of pig-iron contain oxygen and carbon. The

is extremely *brittle and hard*, and possesses scarcely any *malleability*. It still contains a considerable portion of *carbon, and is not entirely free from oxygen!* The next process in the manufacture of iron is to deprive it of these substances, which alter its properties and prevent its application to the purposes of pure or malleable iron. The crude iron is again introduced into a furnace, where it is melted by the *flame of combustible substances*, which is directed to its *surface;* and while it is in the state of fusion it is constantly stirred, so that the whole of it may be uniformly brought into contact with the air.* At last it *swells and gives out a blue flame,*† *and when this is continued about an hour, the iron begins to acquire some consistency, and at last becomes solid.*‡ While it is hot it is removed from the surface, and hammered by the action of machinery; it is then in the state of *wrought or soft iron*,||

carbon exists in the greatest proportion in the *foundry-iron;* and in the least in the *white-iron* last described; its proportion being gradually diminished in the intermediate stages. Its tendency seems to be, to give a *softness and toughness* to the pig, so that, as far as carbon is concerned, the purer the iron is when run from the furnace the less fit it is for foundry purposes."

Manufacture of Iron, Lib. of Useful Knowledge.

* This resembles the method of annealing glass.

† Thomson in his work on Chemistry enquires, "Why does cast-iron expand in the act of congealing?" Water is well known to expand in a similar manner.

‡ Solidity is the essential quality of primitive matter.

|| *Wrought-iron* is a simple substance, and, if pure, would contain nothing but iron."—*Thomson's Chemistry.*

"The process of refining consists in separating a portion of the

from which are manufactured bars of various widths and thicknesses, suited to the different purposes to which it is applied. The most important physical properties of the iron in this refined state, are ductility, malleability,* and tenacity. By

carbon from the pig, and thus reducing the iron to a greater degree of purity, preparatory to the subsequent operation which it has to undergo. This is effected by keeping the pigs in the state of fusion for some time, exposed to a very great heat and a strong blast. How the change is produced, what is the quantity of carbon separated, and combined in what proportion with oxygen, are rather subjects of speculation than demonstrated facts. It would appear that there is a certain combination of *carbon and oxygen* in the pig more favourable than any other for the process of refining, for *dark grey* pigs will produce a much better quality of refined metal than *mottled* or *white*, though it might be supposed, from the latter being combined with less carbon than the former, that they would the more readily part with what they do contain. *The white pig*, in its chemical properties, as far as we know them, approaches very nearly to the *refined metal*. In its appearance, also, and mechanical properties, it is very similar to it. The plate of metal run into the refining mould is very *brittle*, and easily broken into convenient pieces for use at the forge. In its fracture, it presents the same bright silvery whiteness that has been described in the *white pig*. With all this apparent similarity, *white iron* is disliked by the refiner, as occasioning more trouble in working, and producing refined metal of a worse quality than dark grey, bright, or mottled pigs; and it will be seen afterwards that the white pig cannot be wholly substituted for refined metal at the forge. There is then an essential difference in the composition of iron in these two states, though what this difference is has not hitherto been accurately ascertained."—*Manufacture of Iron, Lib. of Useful Knowledge.*

"White cast-iron, which is extremely *hard and brittle*, appears to be composed of a congeries of small crystals. *It can neither be filed, bored, nor bent, and is very apt to break when suddenly heated or cooled.*"

Thomson's Chemistry.

* Sir H. Davy says, "we have no history of the manner in which iron was rendered malleable; but we know that platinum could only

ductility is meant that peculiar property which this metal possesses of being drawn out into wire, without destroying or diminishing the cohesive power of its particles. Indeed, it is capable of being drawn many yards in length, and in every thickness, from one-quarter to one-hundredth part of an inch in diameter. But as this depends upon a particular process, I shall endeavour in this place briefly to explain it. It must first be observed, that it acquires a degree of hardness and elasticity by hammering, or being drawn through a hole, as in the manner of drawing wire, which seems to

have been worked by a person of the most refined chemical resources, who made multiplied experiments upon it, after the most ingenious and profound views."

"Steel is so hard as to be unmalleable while cold, or at least it acquires that property by being immersed, while ignited, into a cold liquid; for this immersion, though it has no effect upon *iron*, adds greatly to the hardness of steel. According to Pliny, steel owes its peculiar properties chiefly to the water into which it is plunged, in order to be cooled. Bergmann, by dissolving in diluted sulphuric acid 100 parts of cast-iron, obtained, at an average, 42 ounce measures of *hydrogen gas;* from 100 parts of steel he obtained 48 ounce measures; and from 100 parts of wrought iron, 50 ounce measures. From 100 parts of cast-iron he obtained, at an average, 2.2 of plumbago, or $\frac{1}{45}$; from 100 parts of steel, 0.5, or $\frac{1}{200}$; and from 100 parts of wrought iron, 0.12, or . From this analysis he concluded, that the cast-iron contains the *least phlogiston;* steel more, and wrought iron most of all; for the *hydrogen gas was, at that time, considered as an indication of phlogiston contained in the metal.* He concluded, too, that cast-iron and steel differ from *pure iron* in containing plumbago."—*Thomson's Chemistry.*

"Azote does not seem capable of uniting with iron. Neither does it appear to form any permanent combination with hydrogen."

Ibid.

depend upon the *expulsion of a portion of its natural caloric!!!** That this is the case, I shall endeavour to show, by compressing the particles of a piece of iron wire by means of the hammer, which will give it an *elasticity proportioned to the quantity* of caloric which is evolved.† You will transfer this idea to what I am going to say relative to drawing-wire.

"Wire is drawn from split rods.

"The first hole merely takes off its edges.

"The second a little more.

"The third a little more, when it becomes nearly round.

"From being drawn through three holes, the particles of the iron are compressed into a state of closer aggregation, and a portion of caloric is evolved, which, together, have rendered it *hard and elastic,* and it cannot be drawn smaller without annulling it.

"Iron possesses the greatest tenacity of any of the metals, and you will probably be surprised when I inform you of the force necessary to overcome the power of *cohesive attraction* among the

* "It is malleable in every temperature, and its malleability increases in proportion as the temperature augments; but it cannot be hammered out nearly so thin as gold or silver, or even copper. Its ductility, however, is more perfect; for it may be drawn out into wire as fine, at least, as a human hair."—*Thomson's Chemistry.*

† Thomson, in his work on Chemistry, enquires, "Does carbonic acid, in a fluid state, ever enter into combination with iron?"

particles of an iron wire, one-tenth of an inch in diameter. A wire of this size is capable of supporting a weight equal to five hundred pounds. The extraordinary tenacity of this metal appears to be owing in part to that fibrosity of its particles which it acquires by being *worked from the crude iron into bars!!*"* (If the fibrosity of iron depends upon the quantity of heat or hydrogen evolved, we may conclude that those fibres by which the embryotic planets were chained to the sun, were tempered to such a degree as to sustain their individual weight during a certain period.) "The power of cohesive attraction in iron is exerted the most in the *longitudinal* direction of its fibres.†

"I shall next consider its expansion and contraction:—Of all opposing antagonist principles, none exhibit so general an enmity as caloric and attraction.‡ These two enemies are in a state of unceasing warfare: attraction continually drawing the particles of matter into a closer union, while caloric is striving to set them more at a distance. It will be found that, when heat is applied to metallic substances, attraction among the particles is overcome, and they are expanded.||

* Lydiard on the Metals, MS.

† Lydiard.—"It is well known that the texture of iron is fibrous, that is, it appears when broken to be composed of a number of strings or fibres bundled together. Its crystals have never been examined."—*Thomson.*

‡ See note (page 22) in the preceding chapter.

|| "Zimmerman," observes Mr. Kirwan, "mixed one part filings

"Lustre, or brilliancy, is another of the most striking characteristic properties of metallic substances, and hence it has been denominated *metallic*

of iron, and three parts sand, sprinkled, or rather covered them with water, and let them stand six months, at the end of which period he found the vessel burst by the expansion of the oxygenated iron, and the sand so firmly compacted, that the mass thus formed could not be broken but by a chisel and hammer."—Henckel Origine des Pierres, p. 405 in note. And that this induration may, and does take place at great depths in the sea, is evidently proved by the observations of Kirwan, Mem. Stakh. 1770, related by Gadd, that "an iron anchor, long deposited in the sea, had hardened into stone all the sand, clay, and shells which surrounded it, to a pretty considerable distance;" and is further confirmed by a similar observation of Mr. Edward King, Philos. Trans. 1779, p. 35, "That a violent storm having laid bare part of the wreck of a man-of-war that had been stranded thirty years before, several masses, consisting of iron, ropes, and balls, were found covered over with a *hard substance*, which upon examination appeared to be sand concreted and hardened into a kind of stone: that which concreted round the rope retained the impression of that part of the ring to which the rope was fastened, in the same manner as the *impressions of extraneous fossils are often found in various strata.* Also, round the iron handle of a brass cannon that remained in the sea a much longer time, a much harder incrustation of sand was found, inclosing cockles, muscles, limpets, oysters, &c., all so firmly fixed and converted into a substance so hard, that it required as much force to break them as to break the fragment of any hard rock."—Ib. 40, 41. It appears also, that a very small proportion of calx of iron is sufficient to produce *induration*, when diffused through the mass of earthy matter, not only by the observation of Kirwan, above related, but also by that of Mr. King, on the induration caused by the point of a nail, in the paper above quoted. "Stones, already formed, may be still further *indurated* by the infiltration of slightly *oxygenated iron;* thus, Dr. Fothergill having watered pieces of Portland stone with water impregnated with iron-rust, found it in a few years to have acquired a sensible degree of such hardness as to yield a metallic sound, *and resist any ordinary tool.*"—Philos. Trans. 1799, p. 44. Kirwan's Geology. Essays, p. 129. "Iron, therefore, under every form, appears to have

lustre. This is owing to the reflexion of a great proportion of the rays of light by metallic surfaces."

a stronger attraction to earths than most other metals, but to magnetic ores, or pyrites impregnated with magnetic aura, it has a more powerful attraction than to any other substance."

Mason Good.

"A portion of a cast-iron gun which had long been immersed in sea-water was incrusted to the depth of an inch with a substance having all the exterior characters of impure plumbago; easily sectile, greasy to the touch, and leaving a black streak upon paper. This substance, digested in water, afforded a small quantity of muriate of iron, but was not otherwise affected. Digested in muriatic acid, a considerable portion was dissolved without any effervescence, and the solution has the properties of pure muriate of iron, with a trace of manganese. The insoluble portion, when collected upon a filter, washed, and dried, was a shining black powder, very soft and unctuous to the touch, and apparently pure plumbago. The relative proportions of the component parts of this substance were,

Oxide of iron	81
Plumbago	16
	97

"Anchors, and other articles of wrought-iron, when similarly exposed, are only superficially oxidized, and exhibit no other peculiar appearance. There can, therefore, be little doubt, that the rapid decay and change of cast-iron are partly to be attributed to a galvanic action, the plumbaginous crust in contact of the cast-metal producing an electromotive combination, aided by and promoting the decomposition of the sea-water, and of its saline contents."

The Doctor Magazine.

In Philos. Mag. vol. xl. p. 75, is the following record:—"A curious concrete mass of iron and zinc, in weight more than a pound, has been presented to the Liverpool Royal Institution from a friend in London. It is part of the residuum which remained in an oven in which some millions of bank-notes had been burnt, and is supposed to have been amalgamated from the materials which have entered into the composition of the ink."

This property is thus alluded to by the poet,

> "Or, like a gate of steel
> Fronting the sun, receives and *renders back*
> Its figure and its heat."

"The next physical property of this metallic substance is its malleability. By this property, and that of welding, we are enabled to form it into the most beautiful and ornamental seal and foliage work, in iron gates, palisades, staircases, &c. The property of welding belongs to iron alone, and it consists of partially *fusing the surface of two pieces intended to be welded together, and in this state placing them on each other and hammering them, when they presently become as firmly united as any other part of the bar!!*"

"Very fine iron wire burns in the flame of a common candle, which sufficiently proves the inflammability of iron in atmospheric air.* Its combustion, however, depends upon the presence of oxygen gas, one of the component parts of atmospheric air, in the proportion of 28 parts in

* "*Iron* may be heated to a greater heat than the flame of spirits of wine."—*Basil Montagu.*

"Iron, at a red heat, rapidly decomposes water, and separates the hydrogen gas. But, on the other hand, when oxide of iron is surrounded with hydrogen gas, and heated, it is rapidly converted into the metallic state, while abundance of water is formed. Here the affinities of the different bases for oxygen seem to have alternately the preponderance."—*Thomson's Chemistry.*

100; it will not be difficult to conceive that all substances which will burn in air that contains only this proportion of oxygen, will burn with much greater brilliancy and rapidity in pure oxygen. In this experiment the oxyde of iron which remains is *three times the weight of the original wire*, because it has taken up the ponderable basis of the oxygen, and when the inflammable substance is saturated, it is rendered incapable of decomposing more oxygen, and the combustion is ended. In urging the fire of a smith's forge with a powerful bellows, we throw in a great quantity of atmospheric air, and consequently of oxygen, which increases the combustion to a *very high* degree, without which it would be impossible to get large masses of iron to a welding heat, which is but a degree lower than absolute inflammability; from this it will be easy to perceive how much skill and attention is necessary in welding ornamental iron-work, otherwise all acute angles and prominent parts would be burnt away." Mr. Brande, speaking of melting the metals by means of the voltaic apparatus, says, "Iron wire was readily melted, and thrown off in globules." Iron is the only metal that takes fire by the collision of flint.

"Steel is a kind of iron, refined by the fire with other ingredients, which renders it *white*, and its *grain closer and finer than common iron*. Steel, of all metals, is that susceptible of the greatest

degree of hardness; whence its great use in the making of tools and instruments of all kinds."* "*It is brittle, resists the file, cuts glass*, affords sparks with flint, and retains the magnetic virtue for any length of time. It is malleable when red hot, but scarcely so when raised to a white heat."†

Mr. Blande, in one of his Lectures, says, "The method of *making steel* is this:—A bar of iron is heated in a vessel containing charcoal, and it is kept exposed for a long time to the heat; it is ultimately found that the bar of iron has been penetrated, or permeated, as it were, with the vapour of carbon, which has combined with it throughout, and formed carburet of iron.‡ When withdrawn from the furnace, it is found to be blistered; its fracture and general appearance are altered, and it is then known under the name of *blistered steel.* The bars of this first manufacture are heated again, and drawn down into smaller bars by powerful machinery and beaten, and it is then called *tilted steel;* which, when broken up and welded, and

* Chambers. † Thomson's Chemistry.

‡ "That steel is composed of iron combined with carbon, has been still farther confirmed by Morveau, who formed steel by combining together directly *iron and diamond.* At the suggestion of Clouet, he inclosed a diamond in a small crucible of pure iron, and exposed it, completely covered up in a common crucible, to a sufficient heat. The diamond disappeared, and the iron was converted into steel. The diamond weighed 907 parts, the iron 57,800, and the steel obtained 56,384; so that 2,313 parts of the iron had been lost in the operation. From this experiment it follows, that steel contains about $\frac{1}{60}$ of its weight of carbon."—*Thomson's Chemistry.*

drawn into bars, forms *sheer steel;* and this, when melted along with some vitrifying flux, and cast into bars, forms what is called *cast steel,* or English steel. The properties of steel are exceedingly singular: its texture varies in different specimens; sometimes it presents more or less of a crystalline fracture, and silky in others; and the appearance of the fracture leads the artist to apply it to particular purposes. You must see, in the selection of steel for any particular use, that the fracture is regular: and if you see a spot in it more white than another, wipe it over with nitric acid; and if the spots become darker, the specimen is not good steel. It melts more readily than iron, and it admits of welding, or uniting with iron, at high temperatures. It has a great variety of curious properties, on which its value in the arts, in a great measure, depends. Here is a piece of steel which is pliable; and if I heat it and allow it to become cold again slowly, I *anneal* it, as it is called, and it is still more flexible than before; but, by rapidly cooling it, it becomes so brittle, that *you may break it like glass.* Now *steel, in this excessively hard state, is a very intractable substance;* but, *if it be gradually heated up to a certain point, it again acquires a degree of softness; and if you heat it red-hot, it becomes as soft as before.* I find that, at a temperature of about 430° it begins to soften; and that at 6 or 700° it becomes very soft, and, there-

fore, by proper management, the artist can give it any degree of hardness he may require, and this process is called the *tempering* of steel. The manufacturer of a razor for example, forges out the blade in the soft state of the metal; he would then finish it, and render it hard by quenching it in water; after which it is heated, until he sees by the colour of the blade, that it is brought down to the degree of hardness required. A razor, and a dinner-knife may be made of exactly the same kind of steel, but the difference in their hardness depends upon their tempering. Experience has taught us, that differences of temperature give to steel peculiar degrees of hardness, fitting it for particular purposes; and, in the common way, the process of tempering consists in heating oil or mercury, or fusible metal, up to a certain point, in which a thermometer is placed, and the best manufacturers are now guided entirely by the thermometer in the process of tempering; whereas, formerly, the instruments were heated without any thermometer, the workmen being guided only by the change in the colour of the steel, which is a very slovenly, and often fallacious test.* Polished steel at 430° begins to acquire a pale *straw-coloured tint*, and

* "Sir H. Davy, in consequence of a letter from Mr. Stoddart, found that when steel is heated in hydrogen gas it does not change its colour as it does when it is tempered in the usual way."

Thomson's Chemistry.

from that to 465°, it becomes so far tempered, as to be fit for razor-blades, and instruments of that kind, requiring delicate edges. From 480° to 500°, it acquires a *buff tinge*, and becomes softer; it is now soft enough for penknives, and certain surgical instruments, and other purposes; at 500°, or from 515° to 530°, it becomes *yellow*, and begins to acquire a *purple* tint; from 530° to 550° it becomes *decidedly purple*, and is then fit for common knives, and other instruments, requiring great toughness. At 550°, or from that to 580°, the steel begins to acquire a *blue* colour; and it is soft enough in that state for a number of purposes, especially for thin blades intended to have great elasticity and little hardness; and, at 590°, it becomes so soft, as to be bent without any risk of breaking, as is the case in watch-springs. This is the history of the tempering of steel; and you see, that by these differences of temperature it acquires various degrees of density and colour; but what the nature of this change is, we do not know: you see, however, how valuable it becomes in consequence. There is not much difficulty in tempering a bar or thin plate of steel; because, when you heat it red-hot, and plunge it into cold water, you obtain an uniform degree of hardness throughout;* but when you have to deal with

* "Steel is so hard as to be unmalleable while cold, or, at least, it acquires that property by being immersed, while ignited, into a cold liquid; for this immersion, though it has no effect upon *iron*, adds

a mass of steel, as with a die, for example, it is a long time before the whole of the heat escapes, and you have a hard crust of steel outside, whilst the interior is soft; you have it only case-hardened; and it sometimes happens, that *these are broken by violence, like the coats of an onion, into layers,—layer after layer, showing a soft nucleus in the midst of the die.* I have now given you the outline of the formation of steel, of the modes of acquiring degrees of induration at different temperatures."*

"The magnet or loadstone is a sort of ferruginous stone, in weight and colour resembling iron ore, though somewhat harder and more heavy." "It is usually found in iron mines, and sometimes in very large pieces, HALF MAGNET HALF IRON. Its colour is different, according to the different countries it is brought from. Norman observes, that the best are those brought from China and Bengal, which are of an irony or sanguine colour; those of Arabia are reddish; those of Macedonia blackish; and those of Hungary, Germany, England, &c. the

greatly to the hardness of steel." "According to Pliny, steel owes its peculiar properties chiefly to the water into which it is plunged in order to be cooled."—*Thomson's Chemistry.*

* "A very curious process for making steel has been lately adopted by Mr. Mushet, of Glasgow, by passing coal-gas through vessels, when red-hot bars of iron are exposed to its action; and it may be a preferable mode, in some cases, to the other."

Mr. Brande's Lectures.

colour of unwrought iron. Neither its figure nor bulk is determinate: it is found of all forms and sizes. The ancients reckoned five kinds of magnets, different in colour and virtue; the Ethiopic, Magnesian, Bœotic, Alexandrian, and Natolian; they also took it to be male and female."*

"The most distinguished properties of the magnet are, that it attracts iron, and that it points to the poles of the world; and in other circumstances also dips or inclines to a point beneath the horizon, directly under the pole; and that it communicates these properties, by touch, to iron. On which foundation are built the mariner's needles, both horizontal and inclinatory."†

"Iron is the only substance which the magnet particularly attracts, and that too when in its metallic state.‡ Nevertheless this metal is so universally diffused, that there are few substances which do not contain a sufficient quantity of it to be in some degree affected by the magnet.|| Iron itself is attracted with different degrees of force, according to the state in which it is with regard to malle-

* Ency. Brit.—"The principal difference observed in these stones consisteth in the sex, (for some be male, others female,) the next lieth in the colour. The bluer any of these loadstones be, the better they are, and more powerful."—*Pliny.*

† Ency. Brit.

‡ Iron "is attracted by the magnet or loadstone, and is itself the substance which constitutes the loadstone."—*Thomson.*

|| "Vast masses of iron or ferruginous matter, actually magnetic, are dug out of the earth almost in every part of it."—*Ency. Brit.*

ability. Even the purest calx or solution that can be made, is said to be in some degree affected by the magnet; but of all substances, soft iron is attracted with the greatest force when clean and of an uniform texture. Hardened steel is attracted with much less force than iron; but the scales separated from red-hot iron, the fused globules from flint and steel, or the finery cinder, are attracted as much as iron itself."*

"Almost every part of animal and vegetable bodies is affected by the magnet after being burned; but unburnt animal and vegetable substances are very seldom, if ever, perceptibly attracted. It is also remarkable, that even *soot, or the dust* which falls upon any thing left exposed to the atmosphere, are sensibly attracted. Colourless precious stones, as the diamond and crystals, are not attracted; neither the amethyst, topaz, chalcedony, or such as are deprived of their colour by fire; but all others, as the ruby, chrysolite, and tourmalin, are attracted. The emerald, and particularly the garnet, are not only attracted, but frequently acquire an evident polarity. The opal is attracted but weakly.

"By heat, the power of a magnet is weakened; and when it arrives at that degree called a white-heat, it is entirely destroyed. On the other hand, the attraction is increased considerably by adding

* Ency. Brit.

more and more weight to the magnet: for thus it will be found that the magnet will keep suspended this day a little more weight than it did before; which additional weight being added to it on the following day, or some other day after, it will be able to suspend a weight still greater, and so on as far as a certain limit. The smallest natural magnets generally possess the greatest proportion of attractive power: so that there have frequently been seen magnets not weighing more than twenty or thirty grains, which would take up forty or fifty times their own weight; but the greatest proportion of attractive power perhaps ever known, belonged to the magnet worn by Sir Isaac Newton in his ring. It weighed only three grains, and was able to take up 746 grains, or nearly 250 times its own weight.

"If a piece of iron be held to one of the poles of a magnet, the attractive power of the other pole will thus be augmented: hence we may understand why a magnet will lift a greater weight from a piece of iron than from wood or any other substance, viz. that the iron appended to the magnet becomes itself a magnet while it remains in that situation; and thus, having two poles, the iron which is placed near the one, increases the attractive power of the other which adheres to the magnet, and enables it to sustain a greater weight than it would otherwise do.

"Soft iron acquires the magnetic power by being

appended to a magnet; but it lasts only while the iron remains in that situation, vanishing as soon as the magnet and iron are separated from each other. With hard iron, but especially steel, the case is quite different; and the harder the iron or steel is, the more permanent is the magnetism which it acquires; though in proportion to this same hardness it is difficult to impregnate it with the virtue."*

"It has been long known that pure iron is not susceptible of retaining the properties of a magnet; but steel, when once magnetized, continues permanently magnetic. Now steel, as we have seen, is a combination of iron and carbon. *When the proportion of carbon united to iron is increased to a certain proportion, as in plumbago, the iron loses the property of being acted on by the magnet.* The addition of a certain portion of sulphur likewise renders iron susceptible of becoming a permanent magnet. The sulphur may amount to forty-six per cent. without destroying this property; but when it is increased to fifty-two per cent. the magnetism vanishes completely. Iron may be made permanently magnetic also when united to phosphorus, but whether the magnetism disappears when the proportion of phosphorus is increased, has not been ascertained."†

* Ency. Brit. † Thomson's Chemistry.

"Magnetic attraction is confined to iron-steel and the natural magnet."* "What Lucretius, in plain words, attributes to the gross air, the spirit, and shews how it presses the iron to this stone, Plato attributes to the divine force in their god, the air. 'It is not art which makes thee excel, but a divine power that moves thee, such as is in the stone which Euripides named the magnet, and some call the Heraclian stone, which attracts iron rings,' &c. This stone is six times mentioned in Scripture by the name פנינים (*pninim*). The condition which makes iron and other things follow it, is expressed in Job, xxviii. 18, by משך (*msk*), ἑλκυσον, *attraction*. Its colour is described (Lamen. iv. 7,) by אדמה (*adme*), flesh-coloured, ruddy, as it is when dug, and more approaching black, as *flesh*; and many of these stones are, when dried and in their parts contracted, of the colour of reddish clay. Its usefulness and worth is expressed by יקרה (*ikre*), by טובה (*tube*), &c. because no other stone of that size is of any real value, except a spark of diamond to cut glass. Sanchoniathon, the Phœnician, says, that Omanus contrived Bætulia stones that moved as having life."†

"This wonderful stone is supposed to derive its attraction and repulsion from the *position in which it is laid in the earth*: for, from the quantity of

* Lydiard. † Higgin's Celtic Druids.

ferruginous, or ironous, matter contained in the earth, as well as many other phenomena, there are many reasons to believe the GLOBE ITSELF TO BE ONE GREAT MAGNET!!!* This solid mineral substance, besides the properties of attracting iron, has others peculiar to itself. One of its characteristic and inseparable properties is, that when it is placed so as to be at liberty to move itself freely, *as if it was suspended by a thread*, or *balanced on a point*, it turns constantly the same part of its surface towards the north-pole of the earth, or a point at no very great distance from it, and consequently the opposite part of its surface towards the south-pole of the earth, or a point but a little distance from it. These parts on its surface are called its poles, and the property itself *magnetic polarity*, or *directive power*."†

* Almost all the phenomena which may be exhibited with a common magnet may also be exhibited with the earth, as far as it can be tried."—*Ency. Brit.*

† "This directive power of the magnet is the most wonderful, and at the same time the most useful property it possesses. By it the mariner can conduct his vessel over the trackless surface of the ocean in any direction; the miner usefully employs it to guide him in the subterraneous excavations, and by it travellers are conducted through deserts otherwise impassable. These properties of the natural magnet can be communicated to iron and steel, which after having acquired the magnetical properties, are called artificial magnets, as the needles of our nautical compasses."

Lydiard's Lectures, MS.

"Now, if a fluid be the cause of magnetism, it is natural to suppose this fluid must flow through the pores of a horse-shoe magnet in the same direction in which it is received, which will be found true if the

To the magnetic properties which belong to iron alone we are indebted for the stability of the uni-

north-pole of a magnet be held about one inch from a suspended needle, it will repel it, but if the other pole of the magnet be addressed to the same end of the needle, it will attract it. Now, when one of these magnets is lain on the other, with the north-pole of the one to the south-pole of the other, it is evident that a contraction must take place, and make them seem as if they had lost their virtue, when placed on a piece of iron; for one may be said to be pulling, while the other is pushing. But if the two positive poles are placed together, and the two negative together, they will immediately take it up. It is in this manner and on this principle that the strong horse-shoe magnets are formed, where six or eight iron bars are united together and lift upwards of an hundred-weight. But in order to make a regular road for this subtile effluvium, it is necessary that a piece of iron should always be in contact with the attracting and repelling poles, by way of a magnetic conductor.

"If one end of a poker, or any bar of iron, that has for any length of time stood in a perpendicular position, be held near one end of a compass, it will attract it; but if I move the poker slowly in its first position till its other end comes near the needle, the needle will be repelled. In this case it is very evident that the *poker is a magnet!!* But how came it so? By standing in the way of the earth's magnetic effluvium. For if a new forged needle be balanced on a point, and then have magnetism given to it by either a natural or artificial magnet, and be suspended again on the other point, it will be found to have lost its balance, and will point so as to form an angle with the horizon of about 73°. This is called the dip of the needle; and is most rationally accounted for by its effluvium falling into and becoming influenced by the stream of the earth's magnetic effluvium. Iron railing, upright bars in windows, tongs, pokers, &c., all become *magnetic* by their *upright* position; being nearly parallel with the dip of the needle.

"If a small thin piece of steel be suspended by its centre of gravity between two fine points, and placed on one *end* of a bar magnet, it will stand *perpendicular* to the bar; if it then be slid towards the other end of the bar, it will begin to incline towards a level; at the *middle* of the bar it will hang horizontally, and then incline and stand with its other end perpendicular to the bar. This appears like a proof that the globe of the earth is one great magnet; and that a similar efflu-

versal fabric, by means of the all important line of gravitation.* We have not only shewn that magnetic

vium flows through it as through the magnets which are detached from it. As iron or ferruginous matter is more particularly diffused through the body of the earth than any other metal, this effluvium can never be in want of conducting matter.

"How far these observations and experiments go to establish the doctrine of a magnetic effluvium flowing through the earth, or from one end of a magnet to the other, I must leave to your judgment and opinion; but if we may venture to guess at causes by effects, and to compare analogies with what we can see and feel, I think we have infinite data in favour of an electro-magnetic fluid."—*Lydiard's Lectures, MS.*

"The electric virtue exerts itself most powerfully on points which are found to carry it off or receive it in vast quantities. In like manner a magnet will hold a piece of iron more powerfully by a corner, or blunt point, than by a flat surface.

"The electric virtue resides on the surface, but that of the magnet pervades the whole substance. A magnet loses nothing of its power by communicating its virtue to other bodies, but electricity always does; and lastly, the magnetic virtue is permanent; whereas that of electricity, without the greatest care, is exceedingly perishable, and capable of being dissipated."—*Ency. Brit.*

* "It is not improbable that iron nearly in a metallic state may be one of the constituent parts of the central mass, and to this it may owe its magnetic polarity."—*Bakewell's Geology.*

"Though, properly speaking, no magnet can have more than two poles, viz. a north and a south one, yet it frequently happens that both the natural and artificial kind are divided, as it were, into several magnets; each of which having likewise a north and south pole, the whole appears to have a number of poles, some of one denomination, and some of the other. This plurality of poles arises sometimes from shape, but more commonly from the heterogeneous nature of the magnet itself; and, with respect to those which have more than two poles, the following laws have been observed :—1. That the parts adjacent to one pole are endowed with a contrary polarity. 2. That the poles of one denomination are not always equal in number, but that they *never differ by more than one:* thus if the magnet has four south-poles, it will either have three, four, or five north-poles. Good and properly shaped magnets however, have only *two poles directly opposite to one another;* though in

action is not confined to our earth, but that masses of iron have been deposited from the heavens on its surface.* The inflammability of iron, its fibrosity, tenacity, metallic lustre, expansion and contraction, with the various methods necessary to be employed for its adaptation to use, furnish ample testimony of its identity with oxygen, and in plumbago it is associated with the diamond; indeed, the very word "adamas" originally signified the hardest species of iron.† I shall only add the following passage from Dr. Prout:—"Iron exists in minute quantities in all vegetable and animal products, particularly in the blood; although its mode of combination, as well as its precise use, are quite unknown.‡ Iron may justly be considered as the most useful of all the metals, and the one that has, perhaps, contributed more towards the civilization of mankind than any other. To form some idea of

truth it is always one-half, or at least a great part of the magnet, that possesses one kind of polarity, the other having the contrary kind; the two points, which we call the *poles*, being only those where the attractive virtue is strongest. These *two points, in good magnets, are joined by a line passing through the centre*, which line is called the axis of the magnet; *and a circle whose plane is perpendicular* to the axis encompassing the middle of the magnet is called its *equator*."

Ency. Britannica.

* "Iron sleet of arrowy shower
Hurtles in the darken'd air."

Descent of Odin.—Gray.

† Voscius.

‡ "Iron, as it is one of the most useful of the metals, so it is one of the most abundant, and at the same time the most universally diffused.—*Lydiard.*

its use, we have only to reflect what would happen if it was annihilated. What substance could be found for it in all the numerous instances in which it contributes to the wants or to the comforts of mankind; particularly through the medium of tools, of almost every one of which it constitutes the essential material?* In short, when we contemplate all the circumstances connected with this metal, its abundance, the manner in which it is mineralized, and the occasion which it thus gives to human ingenuity to extract it from its ores; its wholesomeness,† (for many of the metals are poisonous;) its properties, particularly its extraordinary tenacity;‡ its strength, its property of welding, of being converted into *steel*, and, in this form, of being *tempered* to every degree of hardness we choose; its magnetic properties, &c.,—when we contemplate all these circumstances, it is impossible not to be struck with such varied usefulness, and

* "Without iron the most precious metals would be obliged to remain in shapeless masses, devoid of utility or value."—*Lydiard.*

† "Iron has greater medicinal virtues than any of the other metals." *Hill;* but, "according to Dr. Hooper, it has probably no action on the body when taken into the stomach, unless it be oxidized. During its oxidizement, *hydrogen gas* is evolved."

"The chief use the ancients made of the magnet was in medicine, especially for the cure of burns and deflections on the eyes."

Ency. Britannica.

‡ "It is the hardest and most elastic of all the metals."—*Hooper's Med. Dictionary.*

"Though the lightest of all metals, except tin, it is considerably the hardest."—*Hill.*

to consider iron, not merely as an article evidently designed for the benefit of man, but as the instrument by which he should conquer and govern the world; and thus be enabled to place himself, where it was evidently intended he should be, at the head of the creation."

Carbon.—"By carbon is meant the pure basis of charcoal freed from all the hydrogen and earthy or metallic particles which charcoal usually contains."* "In its crystallized or pure state it is found to constitute the *diamond*, the hardest and most brilliant body in nature."† It has already been stated that the diamond is a non-conductor, while carbon and charcoal conduct electricity.

"If a piece of wood be put into a crucible, well covered with sand, and kept hot for some time, it is converted into *a black shining brittle substance*, without either taste or smell, well known under the name of charcoal. Its properties are nearly the same from whatever wood it has been obtained, provided it be exposed for an hour in a covered crucible to the heat of a forge."‡

"Plumbago is a form of charcoal found native in different parts of the world, and which serves to *diminish friction* when interposed between rubbing surfaces. It is a mineral of a *dark steel-gray colour*, and a metallic lustre; it leaves a dark

* Thomson's Chemistry. † Dr. Prout.
‡ Thomson's Chemistry.

coloured line when drawn along paper. When kept red-hot, it gradually wastes away in the open air, and it burns with great splendor when thrown into red-hot saltpetre."*

"Charcoal is insoluble in water. It is not affected (provided that all air and moisture be excluded) by the most violent heat which can be applied, excepting only that it is rendered much harder and more brilliant.† When charcoal is heated to about 800° in the open air, it becomes red-hot, and continues to burn (supposing it pure,) till it is wholly consumed. But the air in which the combustion has been carried on, has altered its properties very considerably, for it has become so noxious to animals, that they cannot breathe it without death."‡

"From Saussure's experiments it seems clear, that the absorption of the gases, by charcoal, is analogous to the capillary attraction of liquids by very small tubes. The following table exhibits the bulk of the various gases, absorbed by a volume of charcoal, reckoned one:—

* Thomson.

† "Charcoal is the most difficult substance to convert into vapour. Solid sulphur is also with difficulty converted into vapour. The two substances made to combine chemically form bisulphuret of carbon, a thin liquid, not known to freeze at any degree of cold yet produced, and of all substances the most evaporable."—*Donaven's Chemistry.*

‡ "Charcoal is entirely dissipated or consumed in combustion; therefore," says this philosopher, (Stahl) "it must be phlogiston, nearly pure."—*Davy.*

	Volumes.
Ammoniacal gas	90
Muriatic acid	85
Sulphurous acid	65
Sulphuretted hydrogen*	55
Nitrous oxide	40
Carbonic acid	35
Olefiant gas	35
Carbonic oxide	9.42
Oxygen	9.25
Azote	7.5
Oxy-carburetted hydrogen	5
Hydrogen	1.75†

Here it will be seen that hydrogen, the lightest of the gases, is that for which the carbon has least attraction, having a greater affinity with the heavier or dense gases.

Of the combinations of carbon with the above gases I shall enumerate four only: two with oxygen, which are carbonic acid and carbonic oxide, two with hydrogen,—olefiant gas and carburetted hydrogen.

Carbonic acid gas.—"If small pieces of dry charcoal be placed upon a pedestal, in a glass jar filled with oxygen gas, and standing over mercury, they may be kindled by means of a burning glass, and consumed. The bulk of the gas is not sensibly altered by this combustion, but its properties are greatly changed. A great part of it will be found

* "In almost every kind of pit-coal there is a quantity of pyrites or sulphur combined with iron, by miners called brass lumps, from their resemblance to brass; this sulphur is separated and sublimed, or driven off by heat."—*Bakewell.*

† Thomson's Chemistry.

converted into a new gas, quite different from oxygen. This new gas has received the name of *carbonic acid.* M. Lavoisier ascertained, by a very laborious set of experiments, that it is precisely equal in weight to the charcoal and oxygen which disappeared during the combustion. Hence he concluded, that carbonic acid is a compound of charcoal and oxygen, and that the combustion of charcoal is nothing else than its combination with oxygen." "When *diamond* is burnt, nothing is formed but pure carbonic *acid gas.*"*

The following is from the Gazette Médicale de Paris, No. 43, 24th Oct. 1835:—" At a meeting of the Academy of Sciences, Oct. 12th, M. Thiloriet announced that he had reduced carbonic acid gas to a solid form. M. Arago, who read the letter from which the following particulars are extracted, stated that a commission had satisfied themselves of the correctness of the experiments.

"Carbonic acid, which is gaseous at ordinary temperature and pressure, and liquid at 0° (C.) or 32° (F.) under a pressure of thirty-six atmospheres, becomes solid at a temperature of 100° (C.) below the freezing point, or (—148° F.), and remains some minutes in this new condition, even when exposed to the air, without compression.

"Its elasticity, which in a liquid state is so great

* Thomson.

that it produces an explosion equal to the same weight of gunpowder, is destroyed by solidification, and the new solid is gradually dissipated by evaporation. Another curious fact is, that this gas is solidified by its suddenly passing from a liquid to a gaseous state; the near approach of its molecules, which constitutes it a solid, being caused by the expansion of a liquid which occupies instantaneously a space four hundred times greater than its primitive volume. If a jet of carbonic acid is directed into a small glass vial, it becomes rapidly and almost entirely filled with a white floculent powdery substance, which so strongly adheres to the glass, that it cannot be removed unless the bottle is broken. A fragment of solid carbonic acid, slightly touched with the finger, glides rapidly over a polished surface, as if it were raised by the gaseous atmosphere which constantly surrounds it, until it entirely disappears. If a small quantity (*quelques décigrammes*) of this substance is introduced into a small flask, hermetically stopped, the interior becomes filled with a thick vapour, and the stopper is soon driven out violently. Solid carbonic acid is completely evaporated, and only rarely a slight *humidity* remains, which must be attributed to the action of the air on a very cold body, of which the temperature is below that at which mercury freezes. Its abundance, and the promptitude with which it is produced in cavities where neither air nor watery

vapour held in it can penetrate, are characters that cannot be mistaken."

Carbonic oxide.—" When a mixture of equal parts of iron-filings and chalk, both made previously as dry as possible, are exposed to a red-heat in an iron retort, there is disengaged a great quantity of gas, consisting partly of carbonic acid, and partly of a species of heavy inflammable air. When the carbonic acid is separated by means of lime-water, the inflammable gas is obtained in a state of great purity. The name *carbonic oxide gas* has been given it by chemists, and Cruikshanks has shown that it is a *compound of oxygen and carbon.*"* This affords a striking instance of the identity of oxygen and *iron.* This gas " burns with a deep *blue* flame, and gives out but little light. When mixed with oxygen gas, and an electric spark passed through the mixture, it detonates; one hundred measures of it require for *complete combustion* fifty measures of oxygen gas, and the product is one hundred measures of carbonic acid gas. Hence it follows, that it contains just *half* the oxygen that exists in the same volume of carbonic acid gas."†

" Carbon combines with hydrogen in two proportions, and forms two compounds, which have received the names of *olefiant gas,* and *carburetted hydrogen.*"‡

* Thomson. † Ibid.

‡ " Chemists have shown that different volumes of the same gaseous

Olefiant gas.—"It is easily obtained by mixing together in a retort four parts of sulphuric acid, and one part of alcohol, and applying the heat of a lamp while the beak of the retort is plunged into a water-trough. A gas comes over in abundance, which may be received in glass jars inverted over water. Olefiant gas, thus prepared, is invisible, and possesses the mechanical properties of common air. It is destitute both of taste and smell. This gas burns with greater splendor than any other known gas, and detonates very loudly when mixed with thrice its bulk of oxygen gas, and an electrical spark is passed through it. It requires for its complete combustion three times its volume of oxygen gas, and produces, when burnt, twice its volume of carbonic acid gas. The only other product is *water*. Now, two of the three volumes of oxygen gas must have gone to the formation of carbonic acid. The remaining volume must have gone to the formation of water, and it must have combined with a quantity of hydrogen, which in an uncombined state would have amounted to two volumes."

Carburetted hydrogen.—"The other compound of hydrogen and carbon, is a gaseous substance

body, termed carburetted hydrogen, combine together and form various compounds; we have, for example, a gas, one volume of which contains two volumes of carburetted hydrogen; another, one volume of which contains three, and another four, of the same gaseous body."—*Prout. Bridgewater Treatises.*

which exhales in hot weather from *stagnant water*, especially from ditches in the neighbourhood of towns. It is colourless, and possesses the mechanical properties of common air. When pure it has neither taste nor smell. When a jet of it issuing from a tube is kindled in the open air, it burns with a yellow flame, giving out a good deal of light. When mixed with oxygen gas, and when an electrical spark is passed through the mixture, it detonates with considerable violence. It does not burn unless the bulk of the oxygen rather exceeds its own bulk; and it ceases to burn when the oxygen is more than two and a quarter times its own bulk. If we mix it with common air, it burns if it amounts to one-twelfth of the air, and it ceases to burn if it exceeds one-sixth of the air. In all proportions *between* these two extremes, it burns with violence. For complete combustion it requires twice its volume of oxygen gas, and produces exactly its own volume of carbonic acid gas. The only remaining product is *water*. Now it is obvious that one-half of the oxygen went to the formation of carbonic acid, and the other half to the formation of water. This last portion must have combined with a quantity of hydrogen, which, if it had been in an uncombined state, would have amounted to twice the volume of the original gas. The gas which exhales in such abundance in some coal-mines, and which has been

long the dread of miners, under the name of *fire-damp*, is pure carburetted hydrogen.*

* Among the very interesting circumstances elicited by the late examinations respecting the coal-mines, which took place before the Select Committee of the House of Commons, were the following:

"Mr. Nicholas Wood.

"This porosity of the coal, I think, corroborates what we find in experience in working the mines; in the course of working, we find the gas issue *from innumerable pores over the whole surface of the excavation;* that is one mode in which the gas is evolved in the mine, and *the force with which it is evolved depends very much on the depth of the mine*, and other circumstances respecting the dikes that cross the coal strata in almost every direction."

Mr. Buddle, (speaking of the Bensham one-yard seam).

"I found the coal prodigiously fiery, so much so, that the coal itself afforded gas enough to light the pit!!!"

"Was that independent of any particular fissure or brack?"

"Yes; I simply drilled a hole into the solid coal, and stuck a tin pipe into the aperture, surrounded with clay, and lighted it, and I had immediately a gas-light; the quantity of gas evolved from the coal was such, that in every one of those places I had nothing to do but to set a candle, and then could set a thousand fissures on fire: the whole face of the working was a gas-pipe from every pore of the coal; and when the shots were fired for blasting down the coal, they generally set fire to the gas as it was evolved from the coal."—*Mechanic's Magazine.*

"Perhaps nothing tends to give a stronger or more impressive idea of the terrible proximity to danger in which the coal-miner or pitman pursues his labour, than the manner in which the carburetted hydrogen is evolved above-ground at one or two of the Newcastle pits, and was formerly the case also at Workington and Whitehaven. Not far from Wallsend church, a four-inch pipe connected at the pit bottom with an insulated portion of coal strata extending about four acres, is carried up as high as the head-gear; from the orifice of this tube there constantly issues an ignited stream of gas forming a flag of flame, at least eight or nine feet in length. At night, and indeed during the day, this is conspicuous to a considerable distance; and on approaching the spot, such is the force with which the inflammable vapour is emitted, that it produces a sound like the roaring of a blast furnace. The immense natural gasometer in which this tremendous

"Charcoal, however carefully made, always contains a small portion of hydrogen, from which it cannot be freed by heat.* Davy found that when charcoal or plumbago were burnt in dry oxygen gas, there was always an evident deposition of moisture. Hence it is obvious that plumbago, likewise, contains a minute quantity of hydrogen in its composition. It is difficult to determine whether carbon or hydrogen have the strongest affinity for oxygen. Their affinity for *each other* interferes, and promotes the decomposition of those bodies to which they are applied. When red-hot charcoal is plunged into water, the liquid is decomposed; but bihydroguret of carbon (carburetted hydrogen) is formed, so that this is not a case of the simple displacement of hydrogen by carbon. Hydrogen has the property of decomposing carbonic acid gas at a *red heat.* But in this case also the phenomena are

agent is collected, supplies the flame at the rate of eleven hogsheads per minute! There is a similar emission at Willington colliery; the discharge is most vehement when the wind blows from the south-east. Ten times as much gas is evolved annually by this pipe as is used in illuminating the large town of Sheffield. It appears very remarkable that in the coal districts of the British isles, where such a largeness of carburetted hydrogen is annually produced, means have not been adopted for making an economical use of this gas, both as respects light and heat."

* "New-made charcoal absorbs moisture with avidity. Messrs. Allen and Pepys found that, when left for a day in the open air, it increased in weight about 12½ *per cent.* The greatest part of this increase was owing to moisture, which it emitted again copiously when exposed under mercury to the heat of 214°."—*Thomson.*

complicated; for the acid is not completely decomposed, but merely reduced to *carbonic oxide*. The opinion at present entertained by chemists is, that hydrogen has a stronger affinity for oxygen than carbon has; but this opinion is not supported by any facts that can be considered as decisive."*

"Carbon, perhaps, more than any other principle, may be considered as constituting the staminal or fundamental element entering into the composition of organized beings. This is particularly the case in principles from the vegetable kingdom, which owe their peculiar character essentially to *carbon*, and their endless varieties to differences in its quantity, and to the modifying influence of the hydrogen and oxygen with which it is associated. In animal substances carbon exerts a similar influence, but its effects are materially modified by the presence of another staminal principle to be presently considered. Carbon, in some state or other, exists in considerable quantities upon the surface of our globe, but apparently by no means in so large a proportion as oxygen and hydrogen. Exclusively of that actually involved in the composition of organized beings, carbon is met with nearly pure in particular districts, in the well known form of *fossil coals*:† but it occurs in far greater propor-

* Thomson.

† "Carbuncle (*carbunculus*, Latin, a little coal,) *is a jewel, shining in*

tion in combination with oxygen in the form of carbonic acid; *which carbonic acid in union with lime constitutes common chalk and lime-stone, two of the most abundant minerals in nature.** Carbon in its elementary state is a very *inert* substance, and is scarcely liable to be affected by, or to affect organized beings; but with hydrogen and oxygen it forms gaseous compounds of great activity, and capable of proving instantly fatal to animals respiring them. In the mean time it may be observed, that though the compound of carbon and oxygen (carbonic acid) is by innumerable processes con-

the dark, like a lighted coal or candle. 'It is believed that a carbuncle does shine in the dark like a burning coal; from whence it has its name.'—*Wilkins.* Carbuncle is a stone of the ruby kind, of a rich blood-red colour."—*Woodward.*

"This gem was known among the ancients by the name of *anthrax.* It is usually found pure and faultless, and is of the same degree of hardness with the sapphire; it is naturally of an *angular figure, and is found adhering, by its base, to a heavy and ferruginous stone of the emery kind;* its usual size is near a quarter of an inch in length, and two-thirds of that in diameter in its thickest parts: when held up against the sun, it loses its deep tinge, and becomes exactly of the colour of a burning charcoal, whence the propriety of the name which the ancients gave it. *It bears the fire unaltered, not parting with its colour, nor becoming at all the paler by it. It is found only in the East Indies,* so far as is yet known; and there but very rarely."—*Ency. Britannica.*

* "In order to give some idea of the proportion in which carbon exists in different common substances, it may be observed that a pound of charcoal is equal to, and is contained in rather more than *two* pounds of sugar or flour, and eight of potatoes or limestone; so that a mountain of limestone contains the essential element of at least an equal bulk of potatoes, and of a forest that would amply cover many such mountains."—*Dr. Prout.*

stantly forming around us in enormous quantities; by some *compensating means, it disappears as fast as it is formed:* so that the atmosphere, which without this provision would probably before now have become contaminated by carbonic acid to an extent fatal to animal life, barely contains traces of it."*

The same eminent writer we have just quoted says also, "Let us propose to ourselves the question—What ought to be the inherent properties and the constitution of an elementary principle, which should not only be capable of being formed into the *hardest* and the *softest* bodies in nature; but which should also be capable of entering as an essential ingredient into substances so very unlike as sugar, vinegar, wood, oil, albumen, and many others, in all their countless forms and varieties? Nay, what is more, even when the question is answered for us; and when, with the utmost care, and to the furthest extent of our ability, we have studied all the chemical properties of *carbon*—the substance by which the conditions of the question are fulfilled; how totally unable are we to explain these properties, or even to trace them through their simplest modifications? Why; for instance, is the *diamond* capable of assuming the form of charcoal; or why is charcoal capable of assuming the form of

* Dr. Prout.

the diamond? And how are these properties modified, and altered, in all the numerous states of combination into which we know carbon enters? On what property or quality, not possessed by other elements, do all those astonishing capabilities of change depend, which are inherent in this element carbon? And why has carbon been chosen for forming organized beings in preference to silex, to iron, or any other element?" To the last of these questions I would reply that the preference has been given to carbon, because it is of an indestructible nature; to the end that our organized universe may be preserved to its third and perfect state of existence, it has been formed of diamond, which material is by combustion resolved into the simple carbon.*

* "Charcoal is much less liable to putrefy or rot than wood, and is not, therefore, so apt to decay by age. This property has been long known. It was customary among the ancients to *char* the outside of those stakes which were to be driven into the ground or placed in water, in order to preserve the wood from spoiling. New-made charcoal, by being rolled up in clothes which have contracted a disagreeable odour, effectually destroys it. *When boiled with meat beginning to putrefy* it takes away the bad taint. It is, perhaps, the best teeth-powder known. Mr. Lowitz of Petersburg, has shown, that it may be used with advantage to purify a great variety of substances. When putrid water at sea is mixed with about one-ninth of its weight of charcoal-powder it is rendered quite fresh, and a much smaller quantity of charcoal will serve if the precaution be taken to add a little sulphuric acid previously to the water. If the water casks are charred before they are filled, the liquid remains good in them for years. This precaution ought always to be taken for long sea voyages. The same precaution, when attended to for wine-casks, will be found very much to improve the quality of the wine."—*Thomson's Chemistry.*

Hydrogene (so called by Lavoisier) "signifies the generative principle of water; from ὕδωρ, '*water*,' and γεινομαι, '*I produce*.' It is the *lightest* substance yet known, being one-thirteenth of the weight of an equal bulk of atmospheric air."* It is plentifully distributed in nature, and acts a very considerable part in the processes of the animal and vegetable economy. It is one of the ingredients in the varieties of bitumen, oils, fats, ardent spirit, ether, and in fact all the proximate component parts of *animal and vegetable bodies*.† It is one of the constituents of ammonia, and of various other compound gases. It possesses so great an affinity for caloric, that it can only exist separately in the state of gas; it is consequently impossible to procure it in the concrete or liquid state, independent of combination. *Solid hydrogen*, therefore, united to caloric and light, forms hydrogen gas. Hydrogen gas, in whatever manner produced, *always* originates from *water*, either in consequence of a previous decomposition, by which it had been combined in the state of *solid* or fixed hydrogen, with one of the substances employed, or from a decomposition of water actually taking place during the experiment. It is unabsorbable by most substances; water absorbs it very sparingly. It is capable of

* Ency. Britannica.

† This has been shown to be the case with carbon.

dissolving carbon, sulphur, phosphorus, arsenic, and many other bodies. It does not act on earthy substances."* "Hydrogen gas, like air, is invisible and elastic, and capable of indefinite compression and dilatation."† "It is eminently combustible, and if *pure,* burns with a *yellowish-white* flame; but from accidental contamination, its flame has frequently a reddish tinge. Hydrogen inflames with chlorine at a lower temperature than with oxygen. By exposing oxygen and hydrogen, confined in glass tubes, to a very dull red, (about 800° F.) they explode. When this heat was about 700° F. they combined rapidly with a species of *silent combustion.* The inflaming temperature is independent of compression or rarefaction."‡ "It burns rapidly when kindled, *in contact with atmospheric air or oxygen gas,* by means of the *electric spark,* or by an inflamed body; all burning substances are immediately extinguished when immersed in it: it is, therefore, incapable of supporting combustion."‖ "When animals are obliged to breathe it, they soon die. The death is occasioned merely by depriving the animal of oxygen. The animal dies precisely as it would do if plunged under water."§ "If a narrow jar filled with hydrogen be lifted perpendicularly with the bottom upwards, and a lighted

* Dr. Hooper. † Thomson. ‡ Ure.
‖ Dr. Hooper. § Thomson.

taper be suddenly introduced, the taper will be extinguished, but the gas will burn at the surface, in contact with the air."*

To ascertain the purity of hydrogen gas, "mix any quantity of hydrogen gas with its bulk of oxygen, and fire it by means of an electric spark; note the diminution of bulk that takes place; two-thirds of that diminution is hydrogen. Suppose we mix twenty measures of hydrogen and twenty of oxygen, and fire them by means of electricity. Suppose the residual gas, after the experiment, ten measures. Thirty measures have disappeared. Two-thirds of that, or twenty measures, were hydrogen. Therefore, in such a case, the hydrogen examined would be considered as pure."† "The discovery of M. Dobereiner, that a stream of hydrogen made to play on a few grains of pulverulent or spongy platinum placed in a little glass cone, ignited it to such a degree as to kindle the gas, may be regarded as one of the most singular phenomena of chemistry. The aperture of the hydrogen jet should be from one to two inches distant from the platinum, in order that the atmospheric air may be intermingled. *The incandescence continues as long as the gas*

* Ure's Chemical Dictionary. It is the combustion of the oxygen gas deposited from the sun, with the hydrogen ascending from the surface of the planetary bodies, that occasions their luminous appearance.

† Thomson.

continues to flow. It is truly surprising to see, by a re-action apparently mechanical between two forms of matter, *one the lightest, and the other the densest known, so intense an effect!*"* "When five measures of atmospheric air are mixed with two of hydrogen, and a lighted taper, or an electric spark, applied to the mixture, explosion takes place, three measures of gas disappear, and moisture is deposited on the inside of the glass. When two measures of hydrogen, mixed with one of oxygen, are detonated, the whole is condensed into water. Thus, therefore, we see the origin of the name *hydrogen,* a term derived from the Greek to denote the *water-former.* If a bottle containing the effervescing mixture of iron and dilute sulphuric acid be shut with a cork, having a straight tube of narrow bore fixed upright in it, then the hydrogen will issue in a jet, which being kindled, forms the philosophical candle of Dr. Priestley. If a long glass tube be held over the flame, moisture will speedily bedew its sides, and harmonic tones will soon begin to sound. Mr. Faraday, in an ingenious paper inserted in the 10th number of the Journal of Science, states, that *carbonic oxide* produces, by the action of its flame, similar sounds, and that therefore the effect is not due to the affections of aqueous vapour, as had formerly been supposed. He shows that the sound

* Ure.

is nothing more than the report of a continued explosion, agreeably to Sir H. Davy's just theory of the constitution of flame. Vapour of ether, made to burn from a *small aperture*, produces the same sonorous effect as the jet of hydrogen, of coal gas, or olefiant gas, on glass and other tubes. Globes from seven to two inches in diameter, with short necks, give very low tones; bottles, Florence flasks, and phials always succeeded; air-jars from four inches diameter to a very small size, may be used. Some angular tubes were constructed of long narrow slips of glass and wood, placing three or four together, so as to form a triangular or square tube, tying them round with pack-thread. These held over the hydrogen gave distinct tones."* "Hydrogen gas has usually a slight garlick odour, but when *water is transmitted over pure iron in a state of ignition*, it yields hydrogen more free from smell."†

Hydrogen gas "has so great an attraction for oxygen, that it attracts it from *caloric;* so that its inflammable property is merely its power of decomposing oxygenous gas, for it will not burn by itself."‡ "There are instances recorded of a vapour issuing from the stomach of dead persons, which took fire on the approach of a

* Ure. † Ibid. ‡ Ency. Britannica.

candle. We even find accounts, in several works, of the combustion of living human beings which appeared to be spontaneous. The cause of this phenomenon has been attributed to a development of hydrogen gas taking place in the stomachs of these individuals. *Citizen Lair* believed that the bodies of these persons were not burned perfectly spontaneously, but it appeared to be owing to some very slight external cause, such as the fire of a candle, taper, or pipe."* "Hydrogen is the lightest body known, and under the same bulk, therefore, contains less matter than any other body.† It does not exist naturally in a separate state, but always in combination; and by far most generally and abundantly in combination with oxygen in the form of water. Hydrogen ranks, perhaps, next to oxygen in importance, at least as far as organized beings are concerned; since, like oxygen, it constitutes one of the elementary principles of which they are formed. It differs, however remarkably, from oxygen, in not being in its elementary state necessary to the existence of organized beings; indeed, hydrogen is actually incompatible with the existence of animals, if not of

* Hooper.

† "From the great rarity of hydrogen, it is employed for the purpose of inflating varnished silk bags, which are raised in the air under the name of balloons."—*Ure.*

vegetables; and its properties as an element have evidently been sacrificed to its properties as a compound, that is to say, to its properties as *water*. Hence, we have to admire the happy adjustment of the quantities of the two elements to each other, so that the oxygen shall predominate; an adjustment that can scarcely be explained on any other supposition than that of design; for any other cause, as chance, would have been quite as likely to have produced an excess of hydrogen as of oxygen, or at least anything but the exact proportions required. Lastly, it may be remarked, that to the relative proportions of oxygen and hydrogen existing on our globe, more than perhaps to any other subordinate cause, the present order of things owes its stability. For the proportions of these principles are so happily adjusted and balanced, and all the numerous operations dependent upon them are, in consequence, so firmly established, that no material change can possibly happen to any part from an internal cause, but if changed at all, the whole must be changed from without."*

Oxygen.—A term adopted in chemistry to "express the acidifying principle; from οξυς (*acid*), and γινομαι (*to generate*.) It is not found *naturally* in a separate state, but always combined or mixed with some other substance. In its aeriform or elastic state, it

* Prout.

is called by the French chemists *oxygenous gas*,* and is the same as the dephogisticated air of Dr. Priestley and Cavendish, the *empyreal* air of Scheele, the *vital* air and *pure air* of other modern chemists.† It was called dephlogisticated by the followers of Stahl's doctrine, who imagined it to be air *deprived of phlogiston*;‡ the epithet of *empyreal* was given to it by Mr. Scheele, who first discovered it to be the only constituent part of the atmosphere which contributes to support inflammation or combustion.|| He made many curious experiments on inflammation, and was the first who completely analyzed common air, showing it to consist of twenty-seven parts of *empyreal*, seventy-two of

* "One of the most remarkable combinations into which it is capable of entering, is that which it forms with light and caloric. The nature of that mysterious union has not been ascertained, but it is certain that, in that state, it constitutes the gaseous fluid called oxygen gas."—*Dr. Hooper*.

† "It is the cause of animal heat, and hastens germination."—*Ibid.*

‡ That oxygen is the form in which the sun's matter is deposited at our earth, cannot be for a moment doubted; in its progress thence to us it parts with its *imponderable* portion, which is hydrogen. It will be recollected that two volumes of hydrogen form, with the addition of one volume of oxygen, a drop of water. The two volumes of hydrogen are lost, and the third of oxygen falls in its solid state to the surface of our earth's atmosphere, where it forms new combinations. "All bodies increase in *weight* by burning, and there is no loss of *ponderable* matter."—*Davy*. Carbon is heavier than atmospheric air. The imponderable hydrogen alone escapes, and ascends in the process of combustion. (See p. 38 of this work.)

|| "Common atmospheric air was found by Scheele to promote animal life in a manner somewhat similar to its promoting combustion."—*Ency. Britannica*.

foul, and one of *fixed air*. He found these twenty-seven parts only were consumed by a burning body; and that these, during the act of combustion, were united and combined with the *inflammable body* burnt in them, so as to form a compound no longer combustible.* Lavoisier, extending these experiments, found that the body thus produced by empyreal air, being combined with the matter of the inflammable body burnt in it, was, in many cases, an acid; in consequence of which property, he gave this air the name of *oxygen*," i. e. *the generator of acidity*.†

"Oxygen gas is colourless and invisible, like common air. Like it, too, it is elastic, and capable of indefinite expansion and compression. It has not perceptible taste, and, when pure, is destitute of smell."‡ "It is somewhat heavier than common air."|| "It is 740 times lighter than the same bulk of water; its specific gravity is to that of hydrogen

* "When substances are burnt in oxygen gas, or in any other gas containing oxygen, if the air be examined after the combustion, we shall find that a great part of the oxygen has disappeared. If charcoal, for instance, be burnt in oxygen gas, there will be found, instead of part of the oxygen, another very different gas, known by the name of carbonic acid gas. The oxygen, in this case, combines with the combustible body. The new compound formed is called an *oxide*, or sometimes an *acid*. Exactly the same thing takes place when air is respired by animals; part of the oxygen gas disappears, and its place is occupied by substances possessed of very different properties."—*Thomson*.

† Ency. Britannica. ‡ Thomson. || Ibid.

gas as fifteen to one. Its power of refracting light is stated by Biot and Arago to be, to that of hydrogen, nearly as 1958 to 1000. Its capacity for heat, according to Dr. Crawford, is nearly as 4.7 to 21.4."*

The term *oxyd* is used to express "a very numerous class of bodies, formed by the union of certain bases with a smaller proportion of oxygen than what is necessary for their conversion into acids. The most remarkable of these bodies are what were formerly called metallic calces, and have for their base some metallic substance. It is in this state that metals are contained in their ores, from which they are extracted, and converted into the reguline or metallic form, by the process called reduction.† Metals are converted

* Davy.

† "The nature of this process has been much disputed, and the question on this subject involves in itself great part of the controversy between the followers of the immortal Stahl and the justly celebrated Lavoisier, the founders of the phlogistic and antiphlogistic theories, which for some years divided the chemical world. A view of this question, sufficiently distinct, may be taken from the case of metals and their oxyds. Metallic calces, (oxyds,) say the phlogistians, are simple bodies, which, when united with phlogiston, form metals. The process of *reduction* consists, in exposing the ores of metals to an intense heat in contact with some inflammable body, *most commonly charcoal.* During this operation, say they, the charcoal being inflamed, parts with its phlogiston, which is immediately absorbed by the calx, and a metal is formed. Lavoisier and his followers, on the contrary, contended that metals are simple bodies; but that in the state of oxyds, that is, as they commonly exist in their ores, they are combined with oxygen. But as oxygen at a high tem-

into oxyds by combustion, and by solution in acids; and many of them assume this form from the *action of the atmosphere alone, but more readily when this is assisted by moisture.* During their conversion into oxyds, metals loose their splendour, and, acquiring a considerable increase of absolute weight, put on an earthy, pulverulent appearance. It has of late been supposed that all earths are *metallic oxyds*, and that all of them would be capable of reduction, were we possessed of any body for which oxygen had a stronger elective attraction than that by which it is kept in conjunction with the bases of these supposed oxyds.* The term *oxyd*, however, is not confined to the combinations of metals with oxygen, but expresses that *first degree of oxygenation in all bodies* which, without converting them into acids, causes them to approach to the nature of salts; and of these there is a prodigious variety: as, the oxyd of phosphorus, which is the white concrete substance into which that body is converted by combustion; the oxyd of azote, or nitrous air of Dr. Priestley; and a great many others. Most of the oxyds from the vegetable and animal kingdoms have bases compounded of different

perature is more strongly attracted by *charcoal* than by most metals, during the process of reduction the oxyd is decompounded, and the oxygen unites with the *charcoal* to form carbonic acid, leaving the regulus or metal free."—*Ency. Britannica.*

* Iron, (or oxygen in its most ponderable state,) is the base of all metals.

simple combustible bodies. Thus, sugar, all the gums, mucus, and starch are *vegetable oxyds; the bases of which are hydrogen and carbon combined in various proportions.* We find accordingly, that all these bodies are, by *farther additions of oxygen, convertible into acids;* and it is probable that *these acids differ from each other only in the proportion of the hydrogen and carbon in their bases.* The bases of the animal oxyds are still more complicated; all, or most of them, consisting of various combinations of azote, phosphorus, hydrogen, carbon, and sulphur."* "As the world at present exists, oxygen perhaps may be fairly considered as one of the most important, if not the most important substance in it. From its proneness to enter into composition, it is constantly operating upon and modifying every thing. By far the greater proportion of mineral bodies forming the crust of the earth, contain more or less of it; and in all plants and animals it actually exists as a constituent elementary principle. In short, the properties of oxygen stamp it as an element and subordinate agent of the most important kind; while the numberless contrivances which are observable in nature, to secure, or evade, or modify its operations, are most extraordinary, and exhibit some of the most marked and unequivocal evidences

* Ency. Britannica.

of design on the part of their great Contrivor, that we meet with among his works. Several of the most important of these contrivances we shall have occasion to allude to hereafter; but there is one of so curious and interesting a character, that it may be mentioned here as an illustration of the above remarks. The nature and mechanism of the function of respiration will be explained elsewhere, and it is sufficient for our present purpose to state that, by means of a complicated apparatus, the blood is made to circulate through the lungs, in order that it may be there exposed to the oxygen of the atmosphere. For purposes beyond our comprehension, but probably in part at least with a view to the future creation of organized beings, the great Architect of the Universe had willed that this principle should exist upon the surface of our globe in a gaseous state; when he created animals, he chose also to render them dependent upon oxygen for their existence; and he effects his object, not by bending this principle to his purpose, by *altering* its physical or other properties; not by obtaining it from water, or any of the innumerable compounds into which it enters, which according to our imperfect notions he might have more easily done; but, as if on purpose to display his power and design, he rigidly adheres to the properties, both mechanical and chemical, imparted to *oxygen*, and to these properties accommodates his future labours!

The whole, therefore, of the complicated and beautiful apparatus connected with the respiration of animals is most obviously designed and constructed with reference to the properties of the oxygen of the atmosphere, and altogether they afford one of the most striking evidences of adaptation and design presented to us in nature."*

Dr. Ure says that "combustion is powerfully supported by oxygen gas. Any inflammable substance, previously kindled, and introduced into it, burns rapidly and vividly." "If a lighted taper be let down into a phial filled with oxygen gas, it burns with such splendour that the eye can scarcely bear the glare of light; and at the same time produces a much greater heat than when burning in common air. It is well known that a candle put into a well-closed jar filled with common air is extinguished in a few seconds. This is the case also with a candle inclosed in oxygen gas; but it burns much longer in an equal quantity of that gas than of common air."† "If an iron or copper wire be introduced into a bottle of oxygen gas, with a bit of lighted touchwood or charcoal at the end, it will burn with a bright light and throw out a number of sparks. The bottom of the bottle should be covered with sand, that these sparks may not crack it. If the wire, coiled up in a spiral form, like a cork-

* Dr. Prout. † Thomson.

screw, as it usually is in this experiment, be moved with a jerk the instant a melted globule is about to fall, so as to throw it against the side of the glass, it will melt its way through in an instant, or, if the jerk be less violent, lodge itself in the substance of the glass. If it be performed in a bell-glass, set in a plate filled with water, the globules will frequently fuse the vitreous glazing of the plate, and unite with it so as not to be separable without detaching the glaze, though it has passed through, perhaps, two inches of water."* "No substance will burn in common air previously deprived of all the oxygen gas which it contains. But combustibles burn with great splendor in oxygen gas, or in other gases to which oxygen has been added."† "Air, analyzed in different quarters of the globe, in cities, and in the country, on sea and land, has been found not perceptibly different in composition. It has been shown by the experiments of Dr. Priestley, Mr. Dalton, and M. Berthollet, that different elastic fluids have a tendency to rapid equable mixture, even when at rest, and exposed to each other on small surfaces only; and the mixture of the parts of the atmosphere is constantly assisted by winds, by currents of air, and by all the motions taking

* This experiment forcibly reminds us of the singular property of welding which belongs to iron: two pieces of this metal, when their surface is partially fused, are by force made to adhere together.

† Thomson.

place on the surface of the earth. In all processes of *combustion in the atmosphere*, oxygen is either fixed in the combustible body, or it dissolves it, or forms a new compound with it."* "In respiration the volume of air is not changed, but a part of its oxygen disappears, and an equal bulk of carbonic acid gas is found in its place. As the constitution of the atmosphere constantly remains the same, it is evident that there must be some processes in nature by which a quantity of oxygen is produced equal to that consumed. One principal cause of the renovation of oxygen appears to be in the process of vegetation; healthy plants exposed in the sunshine, to air containing small quantities of carbonic acid gas, destroy that elastic fluid, and evolve oxygen gas; so that the two great classes of organized beings are dependent upon each other. Carbonic acid gas, which is formed in many processes of combustion, as well as in respiration, if not removed from air, by its excess would be deleterious to animals, but it is a healthy food of vegetables; and vegetables produce oxygen, which is necessary to the existence of animals; and thus this part of the economy of nature is preserved by the very functions to which it is subservient; and the order displayed in the arrangement demonstrates the intelligence by which it was designed. No other forms

* Davy.

of matter have been produced from oxygen by any processes by which it has been submitted; but it readily enters into combination, and no substance is more active as a chemical agent. Its operations, as will be seen hereafter, are connected with many of the arts; with the processes of *bleaching, dyeing, colour-making, and metallurgy;* and in its various applications to the production of *fire*, it is absolutely essential to cultivation, and to the comforts and enjoyments of social life. In the phenomena of nature, it occasions a wonderful diversity of effects. It is active in most of the *changes* taking place on the surface of the globe, and its constant *tendency is to unite different substances in forms adapted for the purposes of organized life.*"*

I have said in the commencement of this Chapter that water is our gravitating element. "Hydrogen and oxygen, in the proportion of about two measures of hydrogen to one of oxygen, when united chemically, and reduced from the form of an air to that of a liquid, constitute the fluid, water."† It would be useless in a limited work like the present to attempt to give any account of the various properties of water; neither indeed is it necessary to

* Davy.

† Dr. Hooper's Medical Dictionary. "According to Kirwan, all simple substances must have been coeval with the creation, and have existed in the *chaotic fluid*, and originally, at least, in an uncombined state, the component parts of water alone excepted."—*Mason Good.*

do so, for its uses in the operations of nature, its application to the purposes of the arts and life, must be sufficiently understood. I will therefore merely state, in conclusion, that from the testimonials of various authors quoted in this Chapter, the following facts must be admitted:

1. That *Adamas*, or the Diamond, originally signified the hardest species of iron.*

2. That iron is found combined with oxygen.†

3. That carbon and hydrogen are the base of all animal and vegetable oxydes.‡

4. That iron contains hydrogen, oxygen, and carbon.||

5. That carbon, or charcoal, is the diamond.§

6. Carbon and charcoal contain hydrogen.¶

* Vossius. † Lydiard. MS.

‡ Ency. Britannica.

|| Lydiard. MS. "Mr. Bergman informs us, that the great mass of native metal found in Siberia resembles forged iron in its composition, a centenary, or sixty-three grains, yielding forty-nine cubic inches of *inflammable air;* and from many experiments it appears, that ductile iron yields from forty-eight to fifty-one cubic inches of the same kind of air. Dr. Matthew Guthrie informs us, that '*the pores of this iron were filled with a yellow vitreous matter, of such hardness as to cut glass.*' The cells are lined with a kind of varnish contiguous to the glassy substance within."—*Ency. Britannica.*

§ Davy.

¶ Thomson. "It is demonstrated that diamond affords no other substance by its combustion than pure carbonic acid gas; and that the process is merely a solution of diamond in oxygen, without any change in the volume of the gas. It likewise appears, that in the combustion of the different kinds of charcoal, *water* is produced; and that from the diminution of the volume of the oxygen there is every

7. Diamond contains oxygen.*

8. Thus the diamond, like iron, contains hydrogen, oxygen, and carbon.

9. Carbon, nine parts, to one part of iron, constitute plumbago.†

10. Plumbago is not essentially different from the diamond.‡

11. So that the diamond is identical not only with hydrogen, oxygen, and carbon, but with iron also, as we at first stated.

12. Hydrogen and oxygen, united in certain proportions, constitute water.

13. Water frequently contains carbonic acid and iron,|| both of which are to be traced to the diamond.§

reason to believe, that the water is formed by the *combustion of hydrogen* existing in strongly ignited charcoal. As the charcoal from oil of turpentine left no residuum, no other cause but the presence of hydrogen can be assigned for the diminution occasioned in the volume of the gas during its combustion."—*Ure.*

* Davy. "If charcoal be thrown up into hydrogen gas, the hydrogen is first wrought upon, then the oxygen thrown off."—*Brande.*

† Lydiard. MS. ‡ Davy.

|| "Mr. Fourcroy informs us, that it has been discovered some years ago, that iron is often united naturally with the phosphoric acid. The muddy or bog ores are sometimes of this nature: a portion of this compound remaining in the iron gives it the property of being brittle when cold. Iron in this state was called siderite by Bergman, and has since been called water-iron. Different kinds of iron-ore are found adhering in some mines to the tops of caverns in the form of icicles or striæ, sometimes irregularly clustered together, sometimes hanging down like the bristles of a brush; from whence the name of *brush iron-ore.*"—*Ency. Britannica.*

§ "At the late meeting of the British Association, at Bristol, Mr.

14. And the diamond in its most pure and perfect state resembles a drop of clear spring water.*

It may, perhaps, be considered by some of my readers, that in this Chapter I have made too long a digression: prior, however, to entering upon the more minute physiological branches of this work, I have thought it necessary more particularly to identify the materials from which the wonderful fabric of the human machinery is wrought, lest the subject should not be completely understood: it might likewise have been objected by some, that in positively asserting all matter to be diamond, I had assumed too much;—to such I feel assured the evidences here presented from the most undoubted authorities cannot be otherwise than satisfactory. Volumes might have

Cross, of Broomfield, Somerset, stated that he had devoted much of his time to electricity, and he had latterly been occupied in improvements in the voltaic power, by which he had succeeded in keeping it in full force for twelve months by water alone, rejecting acids entirely. Mr. Cross then proceeded to state, that he had obtained water from a finely crystallized cave at Holway, and by the action of the voltaic battery had succeeded in producing from that water, in the course of ten days, numerous rhomboidal crystals, resembling those of the cave; in order to ascertain if light had any influence in the process, he tried it again in a dark cellar, and produced similar crystals in six days, with one-fourth of the voltaic power. He had repeated the experiments a hundred times, and always with the same results. *He was fully convinced that it was possible to make even diamonds, and that at no distant period every kind of mineral would be formed by the ingenuity of man.*"—*Weekly Dispatch, Sept. 4th,* 1836.

* In reference to the transparency of the diamond, Tavernier says, "L'eau que l'on nomme celeste est la pire de toutes, et il est impossible de la reconnoitre tandis que la pierre est boute."

been written on each material separately, but I trust the slight sketch I have given will afford ample illustration of the theory advanced: it will at least afford an opportunity of embracing, in a small compass, the facts which I have found it necessary to become acquainted with myself, by much research, in the pursuit of my undertaking.

CHAP. IV.

THE VITAL PRINCIPLE.

"Life is the triumph of vital over physical laws."

LIFE, the most wonderful of all known phenomena, has occupied the attention of the greatest men of all ages, from the most remote period up to the present time. Animals have been tortured in every possible way which human ingenuity could invent; plants have been dissected, the surface of the globe has been explored: air, earth, and water have from time to time undergone analyzation:—all without effect. The vital principle, until the present period, has eluded every search.

In seeking after unknown causes, we not unfrequently neglect to take notice of the most simple facts which daily present themselves to our observation.

Dew, which is quietly descending to us, to cool the vapour of the globe, has not yet been sufficiently investigated.* There are some seasons of the

* Count Rumford says, "The excessive cold which is known to reign, in all seasons, on the tops of very high mountains, and in the higher regions of the atmosphere, and the frosts at night, which so frequently take place on the surface of the plains below, in very clear

year during which life would be insupportable without these most refreshing heavenly drops. It is well known how much dew contributes to the growth of plants: who has not noticed that during the greatest heat of summer, when dew falls most abundantly,* and rain frequently descends in tor-

and still weather, in spring and autumn, seem to indicate that *frigorific* rays arrive continually at the surface of the earth from every part of the heavens." "May it not be by the action of these (frigorific) rays, that our planet is cooled continually, and enabled to preserve the same mean temperature for ages, notwithstanding the immense quantities of heat that are generated at its surface, by the continual action of the solar rays?"—*Ibid.*

* Judges, vi. 38. "*And it was so, for he rose up early on the morrow, and thrust the fleece together, and wrung the dew out of the fleece, a bowl full of water.*" "It may seem a little improbable to us who inhabit those northern climates, where the dews are inconsiderable, how Gideon's fleece, in one night, should contract such a quantity, that when he came to wring it, *a bowl full of water* was produced. Irwin, in his voyage up the Red Sea, when on the Arabian shores, says, 'Difficult as we find it to keep ourselves cool in the day-time, it is no easy matter to defend our bodies from the damps of the night, when the wind is loaded by the heaviest dews that ever fell; we lie exposed to the whole weight of the dews, and the cloaks in which we wrap ourselves, are as wet in the morning as if they had been immersed in the sea.' P. 87." *See Burder's Oriental Customs.*—"Dews are heaviest in December and January, before the fogs set in. They become perceptible about eight or nine o'clock in the evening, at a time when the atmosphere is perfectly serene and clear. On the Coromandel coast, we are not so much afraid of exposing ourselves to them as they seem to be in other parts of the world. Many Europeans, and almost all the natives, sleep during the night in the open air, without the least injury to their health." *Heyne's Tracts on India.*—"Dew, in agreement with the immediate cause which has been assigned by me for its production, can never be formed, in temperate climates, upon the naked parts of a living and healthy human body; since their heat is never less at night, in such climates, than that of the air. I have, in fact, never perceived dew on any naked part of my own body,

rents, that not only is vegetation most rapid in its growth,* but animals and worms of various kinds, and insects of every description are generated? *Dew, or rain,* however, has never yet been considered the *primary* cause of animal and vegetable organization.† From what I can collect

though my attention has been much occupied, for the last three years, with every thing relative to this fluid, and though I have been, during the same period, much exposed to the open air at night. On the other hand, in very hot countries, the uncovered parts of a human body may sometimes, from being considerably colder than the air, condense the watery vapour of the atmosphere, and hence be covered with a real dew, even in the day-time."—*Dr. Wells.*

* Job, xxix. 19, "*The dew lay all night upon my branch.*"—" It is well known that in the hot eastern countries, where it rarely rains during the summer months, the copious dews which fall there during the night, contribute greatly to the nourishment of vegetables in general. 'This dew,' says Hasselquist, speaking of the excessively hot weather in Egypt, 'is particularly serviceable to the trees, which would otherwise never be able to resist this heat; but with this assistance they thrive well and blossom, and ripen their fruit.'" *Travels,* p. 455.—" Egypt," says M. Savary, " would be uninhabitable, did not the nocturnal dews restore life to vegetables. These dews are so copious, especially in summer, that the earth is deeply soaked with them, so that in the morning one would imagine that rain had fallen during the night. This is the reason why the Scripture promises the Israelites, who inhabited a climate pretty similar to that of Egypt, the *dew of heaven,* (see Gen. xxvii. 39,) as a signal favour."

† " The inhabitants of Lower Egypt, where the overflowing of the Nile covered a sandy desert with *vegetation and life,* might easily adopt the notion that *water,* in different modifications, produced all the varieties of inanimate and organized matter; and thus this dogma characterizes the earliest school of Greece." *Davy.* — Thales, Anaxagoras, Anaximander, and Archelaus believed that living creatures were first generated from *humidity.* *Stanley.*—Pliny, also, was of this opinion, for he writes thus, " The waters bring forth more store of living creatures, and the same greater than the land. The

from Dr. Wells and other authors, I feel convinced that dew does not belong to our globe, the earth, but that it comes directly from the sun to us, and

cause whereof is evident, even the excessive abundance of moisture. It may truly be said, according to the vulgar opinion, that whatsoever is engendered and bred in any part of the world besides, is to be found in the sea: and many more things in it which no where else are to be seen." Sir Isaac Newton says, "that all birds, beasts, fishes, insects, trees, and plants, grow and increase out of water, and aqueous and saline tinctures; and on purification all of them revert into water, or an aqueous liquor again." Also in treating of comets, he says, "They seem necessarily requisite, from whose condensed exhalations and vapours, all that moisture which is consumed in vegetations and putrefaction, and turned into dry earth, may by degrees be continually resupplied and recruited; for all vegetables do entirely grow and increase from liquors; and then, as to their greatest part, do turn by putrefaction into dry earth, and a slime perpetually is precipitated to the bottom of putrefying liquors. From hence the quantity, or bulk of dry earth, must continually increase, and the liquors, or moisture of our globe, continually decrease, and at last be quite evaporated and lost, if they had not as continual a supply from some part or other of the universe." *Tull's Husbandry.*—"It hath been observed by the ancients, that there is a worm that breedeth in old snow, of a reddish colour, and dull of motion; which would show that snow hath in it a secret warmth, else it could hardly vivify." *Bacon.*—"Worms are found in snow commonly like earthworms, and therefore it is not unlike that it may likewise put forth plants." *Ibid.*—There are many who with Aristotle will have the generation of eels to be spontaneous or equivocal, and will not allow them the distinction of sex, from the difficulty how eels should come to be in any pool, pond, moat, or ditch, in which never any were put." *Philos. Trans.*—In Africa, particularly in the neighbourhood of the Egyptian pyramids, the heat is so intense, and the sand appears so parched and burnt, that it seems impossible for either plant or animal to find sustenance, and yet Hasselquist found both here, viz., the condrilla juncea, a small species of lizard, and lion ants innumerable. Scheuchzer and Pallas both observed plants and animals in sulphureous springs. Forskal, in Arabia, Barrow, at the Cape of Good Hope, and Hooker, in Iceland, found different species of conferva and ulva growing in boiling

is always accompanied in its descent with black specks, similar in appearance to soot or flakes of charcoal; these black flakes and specks, during the severity of our winter, become, with the dew and rain, crystallized, and fall to our earth as snow.* Thus it will be seen that dew, when deposited upon our earth, is not a simple but a triple substance, viz., carbon, hydrogen, and oxygen. Who has not experienced the unpleasant sensation caused by snow after it has lain on the ground for a day or two? It no longer retains that beautiful and primitive whiteness which it had on its first descent to the earth: on the contrary, it becomes dirty and spotted, dark, cold, and comfortless, and uneven on its surface. This aspect of snow is not confined to towns or their vicinity, where it might be conjectured to arise from smoke and dust descending from our atmosphere: no, snow presents the same appearance on barren heaths, on mountain tops, or the wildest plains.

Dew is the cause not only of rain but thunder,

springs. The most remarkable account of vegetation at a very high temperature is mentioned in Staunton's account of Lord Macartney's embassy to China. They found, at the island of Amsterdam, a spring, the mud of which, hotter than boiling water, gave birth to a species of Marchantia. The turbo thermalis, a shell-fish indigenous in the Adriatic, is found also in the thermal springs of Abano, at a temperature of 120 degrees."—*Dr. Graves's Introductory Lecture.*

* Anaxagoras maintained, "that snow is not white, but black; nor did it seem white to him, because he knew the water, whereof it is congealed, to be black."—*Stanley's Lives of the Philosophers.*

lightning, and storms of every description. Dew, diurnally descending from the sun towards the surface of our globe in the form of water containing specks of charcoal, not only causes pressure continually upon our atmosphere, retarding its progressive ascent and rarefication, but the vapour forming our atmosphere being thus condensed, impedes, in its turn, the dew descending. Thus, then, are these elements always at war, the one body pressing downwards, the other forcing its way upwards: so that pressure produces electricity and causes thunder, lightning, and torrents of rain. After much rain we generally find a fresh variety and increase of the insect tribe,* blight in the vegetable creation, and epidemics of every description

* "From the warm ferment
Of earth's putrescent, by the clouds bedew'd,
The vermin nations rise, with soul replete,
Thus spreading sense, where sense was none before."

Lucretius.

According to Buffon, "all matter swarms with organic germs or molecules, which serve for the *nutriment* of organized bodies, till they acquire a state of maturity, and augmentation ceases, and for their seminal stores afterwards. But independently of seminal secretion, he contends that when large quantities of these prolific germs are collected in any part of an animal body, wherever such germs are compelled to remain together, they create certain orders of *living beings*, which have always been regarded as *real animals.* The tænia, the ascarides, all the worms found in the veins, in the liver, in wounds, in pus, and most of those discovered in putrid flesh, have, according to this system, no other origin. The eels in paste and vinegar, the tadpoles in the male semen, and all the pretended microscopic animals, are only different forms assumed, according to circumstances, by this

in the animal kingdom, particularly amongst the human race.

active matter, which has a perpetual tendency to organization." *Notes on Lucretius.*—"Of life," Mr. Kirby observes, that "sometimes also, like heat, as in the seed of the vegetable and egg of the animal, it is latent, not manifesting itself by development till it is submitted to the action of imponderable fluids, conveyed by moisture or incubation." That fluidity is life in an *active* state, and that it is indeed a "radiant principle," must be amply shown in this work; and it is of importance that we should recall to our remembrance the scriptural passage in which the Almighty is represented as declaring to Moses, "the *blood* is the life of all flesh, the blood of it is for the life thereof." *Lev.* xvii. 5-14.—Swammerdam, who relates a very memorable instance of the raining of blood which happened at the Hague in the year 1670, tells us, "that one morning the whole town was in an uproar on finding their lakes and ditches full of blood, as they thought; and, having been certainly full of water the night before, they agreed it must have rained blood in the night; but a certain physician went down to one of the canals, and taking home a quantity of this blood-coloured water, he examined it by the microscope, and found that the water was water still, and had not at all changed its colour; but that it was full of prodigious swarms of small red animals, all alive, and very nimble in their motions, whose colour and prodigious number gave a red tinge to the whole body of the water they lived in, on a less accurate inspection. The certainty that this was the case did not, however, persuade the Hollanders to part with the miracle: they prudently concluded that the sudden appearance of such a number of animals was as great a prodigy as the raining of blood would have been; and are assured to this day that the portent foretold the scene of war and destruction which Louis XIV. afterwards brought into that country, which had before enjoyed forty years of uninterrupted peace."—"The animals which thus colour the water of lakes and ponds are the *pulices arborescentes* of Swammerdam, or the water-fleas with branched horns. These creatures are of a reddish-yellow or flame colour: they live about the sides of ditches, under weeds, and among the mud; and are therefore the less visible, except at a certain time, which is in the end or beginning of June: it is at this time that these little animals leave their recesses to float loose about the water, to meet for the propagation of their species, and by that means become

These contending elements are the cause of all the variations of our earth's temperature. This

visible in the colour they give the water. This is visible, more or less, in one part or other of almost all standing waters at this season; and it is always at this season that the bloody waters have alarmed the ignorant." *Ency. Britannica.*—"The red snow, discovered in Baffin's Bay, on the 17th of August, 1818, during the Northern Expedition, under the command of Captain Ross, was found to owe its colour to minute fungi or microscopic mushrooms, which vegetate on the surface of snow as their natural abode." *Dr. Roget.* See *Phil. Trans. for* 1820, p. 165.—Among the plagues which preceded the departure of the Israelites from Egypt, is commemorated the turning of the waters into blood, by which the fishes died, and the rivers became putrid, so that no man could drink them. This was followed by swarms of frogs, of flies, and a grievous plague among the cattle, as well as the human race. After this, there was the plague of hail, and then that of the locusts, which eat up all the fruit and herbs left untouched by the hail, and finally a heavy darkness came over the land. Thus were connected together, by the record of Scripture, the phenomena which we are now recording from profane history, and which seem to have been doubted, and looked upon as fabulous in these our enlightened times. "The raining of frogs is a thing not less wonderful, in the accounts of authors who love the marvellous, than those of blood or stones; and this is supposed to happen so often, that there are multitudes who pretend to have been eye-witnesses of it. These rains of frogs always happen after very *dry* seasons, and are much more frequent in the hotter countries than in the cold ones. In Italy they are very frequent; and it is not uncommon to see the streets of Rome swarming both with young frogs and toads in an instant, in a shower of rain, they hopping everywhere between the people's legs as they walk, though there was not the least appearance of them before. It is beyond a doubt, that the frogs which make their appearance at this time, were hatched and in being long before; but that the *dry seasons had injured them, and kept them sluggishly in holes or coverts;* and that all the rain does is the *enlivening them, giving them new spirits, and calling them forth to seek new habitations, and enjoy the element they were destined in great part to live in.* Theophrastus, the greatest of all the naturalists of antiquity, has affirmed the same thing."

Ency. Britannica.

primary or gravitating elementary body, which is pure oxygen, by constantly pressing on our atmosphere, changes the current of our ascending hydrogen from its natural perpendicular to the horizontal line. Thus we witness, before the coming on of storms, the clouds gathering and flying to and fro in every direction, frequently hurling defiance to all beneath them with a gloom and grandeur increasing with the increasing weight of the descending force, until by pressure and friction a violent electrical concussion takes place, by which the ascending elementary body, hydrogen, comes directly into contact with the descending oxygen; the spark of heat (or vitality) is given off:* evaporation and condensation is the consequence: the imprisoned hydrogen escapes and ascends to a higher region, while the oxygen and carbon, being the heaviest bodies, are precipitated, with a certain proportion of hydrogen, in the form of water.†

* "The formation of dew, indeed, not only does not produce cold, but, like every other precipitation of water from the atmosphere, produces *heat*. Although the temperature of the air was 30°, the hoar-frost on trees rapidly decreased, the solid matter of the trees intercepting radiant heat, which had penetrated through the fog from the sun, and converting it into heat of temperature."—*Dr. Wells.*

† All flame, vapour, and steam rise upwards, nor can any force or pressure make the atmosphere of any body gravitate or descend, until the elastic principle of that body becomes changed. This can never be effected but by contact. From contact combustion is produced, and the electric spark elicited. Thus are solids converted into fluids, and fluids into vapour or steam; steam again into water, and thus is matter returned again to the elementary body, the earth.

These elementary bodies always accompany each other, the carbon preserving the water in the most perfect state of purity, whether it be deposited to us in gentle dew-drops, or showered down in rain, as our varied seasons may require. But with the combustion that is constantly taking place in our atmosphere either silently or otherwise, new formations of matter are generated; amongst these new forms of matter, we find sulphur the most conspicuous, it being the constant attendant upon combustion. Thus sulphur becoming a component part of our atmosphere must, when united with the carbon and salt precipitated from the hydrogen, form azote.* Our atmosphere is said to be a compound

"Invert a glass on a garden-bed when dew is forming, and you will find its inside covered with moisture in the morning. I have taken a portion of mould from a small spot of such a bed; have exposed the former in a thin vessel of horn to the air in a dewy night; have covered the latter with an inverted glass, and, on examination in the morning, I have found the portion of soil exposed to the air and dew drier than that which was covered, notwithstanding the inside of the glass was copiously bedewed. Reflecting on these and some other circumstances, I am almost induced to think, that, if the ground ever gains moisture by dew, it loses much more than it gains by the insensible perspiration which is always taking place from its warmer surface."—*John Davy*, M.D., F.R.S.

* Hosea, xiv. 5, "*I will be as the dew unto Israel.*" "The earth, while it supplies the various plants which grow upon it, is supplied for that purpose very much by the dew, which is full of oleaginous particles. 'The dews seem to be the richest present the atmosphere gives to the earth; having, when putrefied in a vessel, a *black sediment like mud* at the bottom; this seems to cause the darkish colour to the upper part of the ground; and the *sulphur* which is found in the dew may be the chief ingredient of the cement of the earth, sulphur being

of oxygen and azote. The question yet unsolved is from what sources do these bodies first originate?

very glutinous, as nitre is dissolvent. Dew has both these.' *Tull's Husbandry*, c. vi. A lively comment this upon the promise in this passage, 'I will be as the dew unto Israel.'" *Burder's Oriental Customs.*—"Substances of a very different kind from the usual dew are said to have sometimes fallen from the atmosphere. In the Phil. Trans. we are told that, in the year 1695, there fell in Ireland, in the provinces of Leinster and Munster, for a considerable part of the winter and spring, a fatty substance resembling butter, instead of the common dew. It was of a clammy texture and dark-yellow colour; and was, from its great resemblance, generally called dew-butter by the country people. It always fell in the night, and chiefly in the moorish low grounds, and was found hanging on the tops of the grass, and on the thatch of the houses of the poor people. It was seldom observed to fall twice in the same place; and usually, whenever it fell, it lay a fortnight upon the ground before it changed colour; but after that it gradually dried up and became black. The cattle fed in the fields where it lay, as well as in others, and received no harm by it. It fell in pieces of the bigness of one's finger-end; but they were dispersed scatteringly about, and it had an offensive smell, like a churchyard. There were in the same places very stinking fogs during the winter, and some people supposed this no other than a sediment from the fog. It would not keep very long, but never bred worms.—May-dew whitens linen and wax. There is a spirit drawn from May-dew, which has wonderful virtues attributed to it. The method of collecting and preparing it, is described by Hanneman, physician at Kiel. It is to be gathered in clean linen cloths; exposed to the sun in close vials; then distilled, and the spirit thrown upon the caput mortuum: this is to be repeated till the earth unite with the spirit, and become liquid, which happens about the seventh or eighth cohabation or distillation. By such means you gain a very red odoriferous spirit. It is apparently from the preparation of this dew, that the brothers of the Rosy Cross took their denomination." *Ency. Britannica.*—"The dew of autumn is converted into a white frost. Out of dew putrefied by the sun, arise divers insects, which change apace from one species into another; what remains is converted into a fine white salt, with angles like those of saltpetre, after a number of evaporations, calcinations, and fixations." *Ibid.*

The vegetable kingdom is supposed to give off oxygen and take up carbon. This cannot be the case, as the vegetable kingdom will, on further examination, be found to consist of the same materials as the animal, and therefore must be giving off carbonic acid gas, although of a finer and more pure kind than that given off from the animal kingdom. Thus we all know that our atmosphere is more pure in an open fine cultivated country, than in one that is uncultivated, or in or near a large populous city, where there are fires, and where animal effluvia are given off in large quantities. Oxygen comes directly from the sun to us. It is the seed of all life, and is ever accompanied by its antagonist, carbon: for carbon, though it preserves the purity of water and air, and is of itself incorruptible, proves destructive to the finest flowers of our gardens. Walk into the orchard or flower garden on the day following a heavy rain, and then you will observe the purest blossoms of your garden or orchard gone, either dying or become dead. If your fruit is already set 'tis well, but even if this should be the case, how many vermin-brood of insect eggs are deposited, waiting but the noon-day sun to awaken them into active life, to suck the juices from your choicest fruit—to them a planet and a world! *

* "Every insect of each different kind,
In its own egg, cheer'd by the solar rays,
Organs involv'd and latent life displays."—*Blackmore.*

Hydrogen is the base of all alkalies: oxygen, the base of all acids; carbon, the base of all bitters. Hydrogen is the simple, pure, and most active

"Awake and sing, ye that dwell in the dust!
Behold, the dew of the day-light is thy dew!"—*Isaiah*, xxvi. 19.

Mason Good, in a note to his translation of Lucretius, observes upon this passage, "a dew copious and revivifying as the *exhalation* or *stream* of light that pours forth at the dawn in every direction, and *awakens* the world from the *deadness* of sleep."—"Spalanzani detected many vegetable seeds, extremely diminutive in their form, the vitality of which it is almost impossible to destroy either by heat or chemical solvents. In like manner he discovered the eggs of many animalcules confined in vegetable seeds, still possessing a power of producing their definite orders of insects, after such seeds had been exposed to the most intense heat of burning coals, and even the blowpipe itself: and although reduced to the most subtile powder, after having been hereby converted into calces. Thus, too, many animals and vegetables have an equally wonderful power of resuscitation after apparent destruction: among the latter may be mentioned the nostoc and tremella, which perpetually spring up after they have seemed to perish; and among the former the chaos redivivum, the vorticella or wheel animal, the sloth, and the tile eel, a new species discovered by Spalanzani in the impalpable dust of bricks and tiles. In the case of this last insect, the alternate process of death and resurrection was carried on with success, and with the same animalcule, for no less than eleven times, by keeping it dry and without sand, and afterwards moistening it with *water*. Eggs and seeds, after a torpor of months, or even years, are occasionally revived on being moistened with warm water; and in like manner some snail-shells, in the cabinets of the curious, have revived on the same application, after having been kept in a dry state for ten or twelve years." *Mason Good's Notes on Lucretius.*—"The larvæ of the gad-fly, or horse-bee, are destined to live in the stomach of a horse. How shall the parent, a two-winged fly, convey them thither? By a mode truly extraordinary. Flying round the animal, she curiously poises her body for an instant, while she glues a single egg to one of the hairs of his skin, and repeats this process, until she has fixt in a similar way many hundred eggs. These, after a few days, on the application of the slightest moisture, attended by warmth,

element of life, consisting of liquid flame, itself elicited from combustion and friction. Oxygen is the consolidation of the liquid hydrogen into metallic substance.* Carbon is the cinder, or dust,

hatch into little grubs. Whenever, therefore, the horse chances to lick any part of his body, to which they are attached, the moisture of the tongue discloses one or more grubs, which, adhering to it by means of the saliva, are conveyed into the mouth, and thence find their way into the stomach. But here a question occurs to you. It is but a small portion of the horse's body which he can reach with his tongue; what, you ask, becomes of the eggs deposited on other parts? I will tell you how the gad-fly avoids this dilemna: and I will then ask you, if she does not discover a provident forethought, a depth of instinct, which almost casts into the shade the boasted reason of man. She places her eggs only on those parts of the skin which the horse is able to reach with his tongue; nay, she confines them almost exclusively to the knee, or the shoulder, which he is sure to lick. What could the most refined reason, the most precise adaptation of means to an end do more?"

Kirby and Spence's Entomology. Vol. i., p. 339.

* Oxygen is the hydrogen gradually become cooled by change of temperature. "Dew, according to the theory of Dr. Wells, now generally adopted by philosophers, depends upon two principles,—the radiation of heat, and the condensation of invisible vapour. Before dew can be deposited on any substance, it must become colder than the surrounding atmosphere. It must have been long known that dew is cold, for, as Dr. Wells states, both Cicero and Virgil apply to it the epithet 'gelidus;' and Herodotus, speaking of the crocodile, says that in Egypt it passes the greater part of the day on land, but that it passes the night in the waters of the Nile, they being warmer than the *natural atmosphere and the dew.*" *Higgins's Earth.*—"The vapour of the surrounding air will be condensed upon the bodies whose temperature is lower than that of the air itself. The deposition of dew depends upon the production of a lower temperature in the body bedewed, than in the atmosphere which surrounds it. Now all the bodies which radiate more heat than is conveyed to them by the earth, or any substance with which they may be in contact, when thus lowered, are covered by a condensed vapour, which we call dew." *Higgins.*

resulting from the union of the two former. These three elementary bodies are always united: they are all necessary to the existence of each other, and can never be entirely separated; when, however, these three materials come into close contact by surrounding pressure on the atmosphere,* the electric spark on liquid flame escapes, and locomotive animal life is generated.† In the aerial species

—"The deposition of dew is always most abundant during calm and cloudless nights, and in situations freely exposed to the atmosphere. Whatever interferes in any way with the process of radiation as might be expected, has a great effect on the deposition of dew. Hence the radiation of heat, and consequently the deposition of dew, is not only obviated by the slightest covering or shelter, as by thin matting or even muslin; by the neighbourhood of buildings, and innumerable other impediments near the earth's surface; but matters interposed at a great distance from the earth's surface have precisely the same effect. Thus clouds effectually prevent the radiation of heat from the earth's surface; so that cloudy nights are always warmer than those which are clear, and, in conseqence, there is usually on such nights little or no deposition of dew." *Dr. Prout.*—Dr. Wells remarks, "upon one serene and still night, I placed fresh parcels of wool upon grass every hour, and by weighing each of them, after exposure for an hour, found, that they had all attracted dew."—"Several substances exposed to the same dew, receive and charge themselves with it in a very different manner; some more, others less, and some even not at all. The drops seem to make a sort of choice of what bodies they shall affix themselves to; *glass and crystals are those to which they adhere in the most ready manner and in the largest quantity;* but metals of all kinds never receive them at all, nor do the drops ever adhere to them."

Dr. Prout.

* Each of these elementary bodies has an atmosphere of its own and also a general one surrounding the whole: all united, the three simple elementary eggs become one whole animal.

† "All animal and vegetable bodies are composed of three, or at most, four elementary substances." *Mr. Brande.*

of animal life, such as birds and insects of every description, particularly flies, the carbon and hydrogen predominate. In the larger animals that move on the solid body of the earth, the hydrogen and oxygen prevail. In the lowest species of the creation, such as burrow in the bowels of the earth, the carbon and the oxygen must always predominate; for however low and degraded the animal may be in the scale of life, still oxygen must be the base, and form the first germ of terrestrial animal structure, carbonic acid gas forming the fluid atmosphere surrounding every animal whether simple or compound in its mechanism. Animal life progresses in the scale of creation by the increase and number of animal bodies uniting together, giving to the elementary properties of the whole greater solidity, accidity, and elasticity. Thus living animals are constantly shooting forth, radiating and ascending one layer above another: first, solid embryotic eggs; secondly, these eggs giving off their fluid as carbonic acid; and thirdly, their aeriform, until they have ascended from the very centre of all the different planets up to the surface of their atmosphere: a separation then takes place, and so on until they arrive at the body of the sun whence they have all emanated.

It is an error to suppose, as I have before stated, that oxygen is produced from the vegetable king-

dom. The animals that live in the bowels of the earth all throw up their carbonic acid gas to the surface of this globe, where a boundary case or shell is formed and a perfectly new structure of animals created from the scum or very worst materials of the old. The carbonic acid forcing its way up to the surface, makes cracks and fissures in the crust of the earth, and thus opens a path for the descending elementary body, oxygen, when the carbonic acid gas becomes again purified and forms dew. By this means vegetable life is generated all over the surface of this planet. Vegetable life is but a second or more perfect state towards animal perfection. We have now one moving body, the earth, enclosing in its bowels all the different varieties of the lowest scale of animated life, all arranging themselves according to the specific gravity of the materials forming their base and superstructure. First, solid, as iron; secondly, fluid, as water; thirdly, aeriform, as carbon. Thus, while one generation of animals is descending in the scale of creation, another is ascending, forming a more perfect and larger species of animals from the decomposition of the preceding race. Carbonic acid gas, forcing its way to the circumference of the whole globe, forms there a boundary or case containing the simplest forms of living animalculæ, of the very worst and most degraded species. These animals,

however, are destined to lay the foundation or seed-bed of a higher and more perfect structure of progressive creation. The oxygen filtering down in pearly dew-drops daily from the sun, purifies and crystallizes the carbonic acid, when an entire new seed is generated at the surface of our globe, covering the whole earth with the choicest productions of animated nature, presenting all the varied colours of the vegetable kingdom as now distributed over the surface of this our planet. Thus, in the words of the poet—

> "To every form of being is assign'd
> An active principle: howe'er removed
> From sense and observation, it subsists
> In all things, in all natures, in the stars
> Of azure heav'n, the unenduring clouds,
> In flower and tree, and every pebbly stone
> That paves the brooks, the stationary rocks,
> The moving waters, and the invisible air."

CHAP. V.

VEGETABLE LIFE.

"The Creator of the atmosphere must have been also the Creator of plants and animals: we cannot for an instant believe the contrary."

Whewell.

"From off the boughs each morn
We brush mellifluous dews, and find the ground
Cover'd with *pearly grain.*"* *Milton.*

"It is well known that, in all places where vegetation has been established, the germs are so intermingled with the soil that wherever the earth is turned up, even from considerable depths, and *exposed to the air,* plants are soon observed to spring, as if they had been *recently sown,* in consequence of the germination of seeds which had remained latent and inactive during the lapse of perhaps many centuries.† Islands formed by coral

* "The comparison of dew-drops to pearls, or gems, is beautifully delicate, and has seldom been forgotten by poets of any nation, whenever they have had an opportunity of introducing it."

Mason Good.

† "A few years ago, a house was built in Newcastle-on-Tyne, and the earth which was dug out of the foundation was thrown on a piece of ground in the front, intended for a garden. The following spring a number of caper plants came up; for they were not common in that

reefs, which have arisen above the level of the sea, become, in a short time, covered with verdure. From the materials of the most sterile rock, and

part of the country, and their appearance therefore created a good deal of surprise. Upon enquiry, it was found that some years before this ground had been a public garden; it therefore appeared certain that these seeds had remained dormant whilst buried deep in the earth, and had sprung to life as soon as they were brought within the influence of heat and light.

"These facts are sufficient to prove that seeds do not lose their vitality through a long period of time."

Jesse's Gleanings in Natural History.

"It is more than a century since it was observed that plants were nourished by pure water and atmospheric air; that from these alone they derived their extracts, their mucilage, their oils, their coal, their acids, their alkalies, and aroma."—*Ency. Brit.*

"Plants that come up in any land of a different kind from the sown or planted crops, are weeds. That there are in nature any such things as *inutiles herbæ*, the botanists deny, and justly too, according to their meaning."—*Tull's Husbandry.*

"I think nothing can be said more strongly to confirm the truth of this, than what is related by the authors quoted by Mr. Evelyn, (p. 17, 18, 19, of his *Phil. Discourse of Earth*,) to this effect, viz.

"'Take of the most barren earth you can find, pulverize it well, and expose it abroad for a year excessively agitated, (that is, *stirred* often,) it will become so fertile as to receive an exotic plant from the furthest Indies, and to cause all vegetables to prosper in the most exalted degree, and to bear their fruit as kindly with us as in their natural climates.'

"'This artificial dust,' he says, 'will entertain plants which refuse dung and other violent applications, and that it has a more nutritive power than any artificial dungs or compost whatsoever;' and further, that, by this toil of pulverizing, 'it is found that soil may be so strangely altered from its former nature as to render the harsh and most uncivil clay obsequious to the husbandman, and to bring forth roots and plants which otherwise require the lightest and hollowest mould."—*Tull's Husbandry.*

"We find, therefore, that moisture, air, and a due temperature, are

even from the yet recent cinders and lava of the volcano, nature prepares the way for vegetable existence. The slightest crevice or inequality is sufficient to arrest the invisible germs that are always floating in the air, and affords the means of sustenance to diminutive races of lichens and mosses.* These soon overspread the surface, and are covered in the course of a few years, by successive tribes of plants of *gradually increasing size and strength,* till at length the island, or other favoured spot, is converted into a natural and luxuriant garden, of which the productions, rising from grasses to shrubs and trees, present all the varieties of the fertile meadow, the tangled thicket, and the widely spreading forest. Even in the desert plains of the torrid zone, the eye of the traveller is often refreshed by the appearance of a few hardy plants, which find sufficient materials

certain requisites for vegetation; and you find that they should be present in *due proportion,* and should co-operate for the healthy growth of the vegetable."—*Professor Brande on Vegetable Chemistry.*

* "The slimy matter often seen on rocks and stones, on hard gravel walks, and on damp walls and cellars, or on the glass of windows, garden-pots, and so forth, and which is often so minute as to be lost to ordinary vision, consists of curious and most admirable vegetable structures. All the green pulverulent coating seen on old trees and palings is also found, by microscopic observations, to be composed of an infinite number of small plants, of an exceedingly primitive formation. The slimy masses known as Will o' the wisps, or Nostocs, are instances of other allied species, some of which are called by the common people 'flowers of heaven.'"—*Professor Burnett.*

"Professor Burnett observes that the phenomenon of red snow seems

for their growth in these arid regions; and, in the realms of perpetual snow which surround the poles, the navigator is occasionally startled at the prospect of fields of a scarlet hue, the result of a wide expanse of microscopic vegetation."*—*Dr. **Roget**.*

in some cases to depend upon the sudden appearance of a very minute plant, which the microscope declares to consist of small cells filled with a red fluid, and which is referred to a genus named, from its very simple structure, '*Proto-coccus.*'

"Palmella cruenta, or gory dew, is common in many places: I found it abundantly during 1831 and 1832, at Oxford; and it is frequently observed in damp situations, forming 'broad indeterminate patches of a deep rich purple, with a shining surface, as if blood or red wine had been poured over the stone or ground.' 'During dry weather it contracts, grows dull, and disappears; but after rain spreads anew, resumes its sanguine colour, and becomes conspicuous even to vulgar gaze.' But not only have we at times showers of the so-called red or bloody snow, rain, &c., and gory dew, ice, and so forth, produced as above explained, but occasionally these storms and dews are found of different colours; as green, blue, and yellow. These analogous phenomena are owing to plants not very different in their nature: the blue to *Byssus cobaltiginea*, the green to *Palmella botryoides*, the yellow to *Lepra candelaris* or *chlorina*, and other tints to other plants. 'Both snow and ice were seen stained with red, green, and blue, by the late expedition, under Baron Wrangel, to the Frozen Ocean, (N. L. S.;) and Humboldt says that red hail has been seen to fall at Paramo de Guanacos, on the road from Bogota to Popayan.—Agardh, in an interesting memoir, mentions several of these supposed preternatural occurrences, that in different ages have been recorded, some of which have been looked upon as direct signs of the anger of the Deity. The learned Professor observes, that red snow is very common in all the Alpine districts of Europe; where it is most probably of the same nature as that brought from the North Pole by Captain Ross. Saussure saw it in abundance on Mount Brevern, in Switzerland, frequently among the Alps, and elsewhere; Ramond found it on the Pyrenees, and Sommerfeldt in Norway. In March, 1808, the whole country about

Vegetable life exists in three distinct successive states. The first of these is the solid or oval, as the seed; the second, the fluid or fœtal, which is the expansion of the former seed into a bulb or root; the third, the aeriforme or locomotive,* is the full formed and perfect plant.

Cadore, Belluno, and Feltri was in a single night covered to the depth of twenty centimetres with a rose-coloured snow; at the same time a similar shower was witnessed on the mountains of Veltelin, Brescia, Krain, and the Tyrol. A similar one occurred at Tolmezzo, in the Triaul, between the 5th and 6th of March, 1803; and, on the 16th of April, red snow fell on the mountains of Toual, in Italy. But the most remarkable red-snow shower on record was that which fell on the night between the 14th and 15th of March, 1823, in Calabria Abruzzo, in Tuscany, and at Bologna; consequently, along the whole chain of the Apennines. Captain Ross states, that the mountains he found covered with red snow are about eight English miles in length, and six hundred feet in height. The red snow he also observed to penetrate, in some places, to a depth of ten or twelve feet; and, he says, it seemed to have existed long in the same state.

The above species "are always found in situations in which they are exposed to the intense action of light; such as vast plains of snow, or masses of glittering limestone; whence it is inferred that the colour of the red snow is attributable to the action of *light*, modified, in some mysterious manner, by the nature of the body on which it strikes: in confirmation of which hypothesis, it is remarked that, when Lepraria kermesina is found under the stems of trees, stones, or in the crevices of rocks, where light can scarcely gain admittance, its colour gradually passes from red to green. The chief difficulty in the way of this explanation of its nature is in the statements of so many observers, that the red snow falls from the air."—*Prof. Burnett.*

* "Perhaps one of the most extraordinary phenomena connected with vegetable life is the tendency of plants to follow light, which seems so necessary to their health, and even to their existence: this makes them display what Blumenbach calls *real motion.* In the Memoirs of the American Academy of Arts and Sciences at Boston, there is an excellent example of this tendency described. In the

The first or crystalline state is the seed of the future plant.* The seed of every plant is pure

spring, a potato was left in a cellar where some roots had been kept during the winter, and which had only a small aperture for the admission of light at the upper end of one of its sides. The potato, which lay in the opposite corner of the aperture, shot out a runner, which first ran twenty feet along the ground, then crept up along the wall, and so through the opening by which light was admitted. Many plants (common duckweed, for example,) are not firmly attached to the ground by their roots, but can change their situations at certain seasons of the year, sinking at one time to the bottom, and at others coming to the surface of the water."

Chambers's Edinburgh Journal.

* "Several large and very curious groups of plants, which are allied to the Zoocarpes, but distinctly vegetables, have been collectively denominated FLAGS or ALGÆ. Their English name has reference to the flagging habits of a large proportion; as, for example, the sea-weeds, which are usually fixed to rocks or stones, and flag,—i. e. droop or float, according as the water quits them or bears them up. *Alga*, the technical synonyme, is said to be derived *ab algore*, coldness; as if the nominator had supposed that some of these productions, which are chiefly aquatic, were formed by the *congelation of films or drops* of water; to which, indeed, many bear no slight resemblance. To this ancient hypothesis there seems to be allusion in the names of several: e. g. *Ulva* (ab uligine,) signifies ooziness or moisture, as our English word *Laver*, from *laver* (à lavo), to wash, literally means *froth, scum*, or *lather*; whence, perhaps, lăver or lāver. Again, *Halymenia*, if literally translated, gives a pellicle of sea-water or sea-membrane. Thus, also, *Achnanthes* is sea-froth; *Anthachne*, froth-flower; and *Alcyonidium*, the foam of the sea." . . . "Thus, our own mildew is but a contraction of *soft* or *mild dew*, referring to the delicate texture of the minute plants of which mildew consists, and of which each spot is as it were a forest.

"In the ocean, in rivers, and especially in stagnant water, as well as in many damp situations on shore, myriads of minute animals and plants exist, which for ages were utterly unknown; or, if noticed, were taken for the foam of the waves, or the exuviæ of the bodies amongst which they abound. So minute are some of these infinitesimals of vitality, that, in a drop of water, it is said, there might be suspended

diamond*. In this primitive condition, life is latent or inactive: the seed may be preserved so for many centuries (if kept from moisture), and afterwards will yet become organized. "Mr. Ray Wilson adduces, as a proof of the length of time during which the vital principle of vegetables may be preserved, the fact that a bulbous root found in the hand of an Egyptian mummy, where it had been

five millions; and eight hundred millions, that is, almost as many as the entire human population of this globe, might, if collected, be contained in the space of *one cubic inch.* Yet, small as are these *monads,* their structure is by no means so simple as is their bulk reduced; for Ehrenberg describes those species which, from their ultimate atomic minuteness and resemblance to fine dust, have been called *termo, atomus,* and *pulvisculus,* to possess each from four to six, and in the atom many stomachs; and, furthermore, in the allied genera, he has counted no fewer than from one to two hundred stomachs: i. e. from one to two hundred internal sacs, or digesting pouches, into which coloured fluids have been seen to pass."

Professor Burnett's Outlines of Botany.

* "Whence did the vegetable tribes originally derive the carbon of which their solid parts are principally composed? Carbon either previously existed in nature, or trees and plants had the power of forming it from more simple elements. If carbon be a compound substance, of which *hydrogen* is a constituent part, it may be formed by the process of vegetation, or it may exist also in the mineral kingdom independent of organic productions."—*Bakewell's Geology.*

"In many kinds of seeds, including all the grasses, there exists a substance, which, before the seed is fully ripe, resembles the white of an egg surrounding or partly surrounding the embryo. On the seed arriving at maturity, it becomes more indurated, and in the grasses is farinaceous, forming the bulk of the seed. In some plants it is of a woody consistence; this is commonly termed the albumen, and is said to afford the embryo nutriment; but, if the date-stone be an albumen, as is generally supposed, it seems rather against that opinion, as it is as *hard as flint.*"

Stroud's Physiological and Systematic Botany.

2000 years, germinated, and, when put in the ground, grew vigorously;" and, to my own knowledge, a bag of beans, found some years since in the ruins of Herculaneum, being sown in a garden at Chelsea, took root, and produced as usual.*

The second, or Fœtal Life, is the organization of the former seed into a root, prior to its appearance above ground.

When a seed is planted in the ground, its envelope or wrapper of charcoal imbibes moisture from the surrounding particles of earth, and thus the wrapper soon becomes dissolved in the general mass. The

* "The absence of liquid matter in the composition of seeds renders them comparatively insensible to heat and cold, so that they may be carried without detriment through climates where the plants themselves would instantly perish."—*Lyell's Geology.*

"The seeds of most sorts of weeds are so hardy as to be sound and uncorrupt for many years, or perhaps ages, in the earth; and are not killed until they begin to grow or sprout, which very few of them do unless the land be ploughed, and then enough of them will ripen amongst the sown crop, to propagate and continue their species, by shedding their offspring on the ground, (for it is observed they are generally ripe before the corn,) and the seeds of these do the same in the next sown crop; and thus perpetuate their savage wicked brood† from generation to generation.

"Besides, their seeds never all come up in one year, unless the land be very often ploughed, for they must have their exact depth and degrees of moisture and heat to make them grow; and, as such as have not, these will lie in the ground, and retain their vegetative virtue for ages; and the common usual ploughings not being sufficient to make them all or the greatest part grow, almost every crop that ripens increases the stock of seed, until it make a considerable part of the staple of such land as is sown, without good tillage and fallowing."—*Tull's Husbandry.*

† The French call them *les herbes sauvages* and *les méchantes herbes.*

seed within is pure crystalline diamond encased in iron, and these materials composing the seed can never be separated or dissolved but by contact. These solid seeds, then, remaining after all their exterior and visible form has undergone dissolution, become a nucleus of attraction. The matter attracted is analogous to that which attracts (the seed), and converges to it as a central point: we all know seeds will only grow in such soils as are congenial to their nature: the attraction continues, and the particles accumulate by this means till pressure or friction is the result; and heat being given off from the centre, the surrounding particles of earthy matter are separated, and structural fibres shoot forth from the midst of this gaseous fluid.* The crystal seed,

* "The only remaining part of the plant which we have to notice is the seed; and, with regard to it, you will find that it consists of three parts. The bulk of the seed is made up of a substance intended for the nourishment of the young plant, and is called *cotyledon;* it gradually dies away as vegetation goes on, and you cannot take a better instance, by way of illustration, than the common garden bean. If you divide the external membrane, you will separate it easily into two parts; and if you examine that part called the *eye of the bean*, you will see that there is a small projecting substance which developes itself the first, when the bean grows; it then becomes the root, and is hence called the radicle; whilst between it and the cotyledon is the germ of the young plant, called the plumula; this is the part which afterwards produces the stem and leaves. These parts are all covered by an investing membrane. We have some plants containing four or six, or more, cotyleda; some only one, as is the case with the common wheat, and these are called mono-cotyledous plants; those containing two, dicotyledous; those containing three, tricodyledous, and so on." *Prof. Brande on Vegetable Chemistry.*—"When you sow a seed, and place it

having thus burst its iron bond, is converted into an elastic tube or bulb of gelatinous fluid matter. In this manner the fœtal life commences. Imbibition is but a multiplication of the force of attraction. All fluids are now drawn by suction into the radix, or heart of the plant: thus is the heart nourished and empowered to throw off new layers of matter uncongenial to itself. The root absorbs, expands, and becomes elastic, throwing off all offensive and superfluous matter. By the law of repulsion, all fluids

under favorable circumstances, it begins to swell, and the consequence is that it bursts its external membrane; the radicle begins to shoot downwards, and to throw out little ramifications, which ultimately become the perfect root; and the plumula, rising upwards, expands itself, throws out a stem, and ultimately flowers. The cotyleda, which appear to have been, during this process, inert, rise up as two leaves, which are very important for the protection of the young plant. You find, during this time, that there is a number of vessels shooting through the cotyleda, which are connected with the radicle and plumula at this junction; these are the absorbent vessels, which, in the young plant, take up the nutritious matter from the soil; and, when the plant has put forth its leaves, the cotyleda become useless, as the young plant is then capable of abstracting sufficient nutriment from the atmosphere, and which, with what is abstracted from the soil, is sufficient for the future existence of the plant. The cotyleda then rot away. These changes take place when the seed is exposed to favorable circumstances. A due temperature is necessary for the production of these phenomena; a few seeds, it is true, will germinate, *under the freezing point*, but, generally speaking, not; a due degree of temperature is therefore necessary. The temperature most favorable for germination is that between 40° and 80° of Fahrenheit, and, within the range of these temperatures, it generally takes place. *Moisture is absolutely requisite; so much so*, that without it the seed will remain inactive." *Prof. Brande.*

have the power of forming for themselves a membrane or web to protect their vitality, and in this membrane is seated the life of the fœtal plant, which, in the manner described, progresses to the complete structure of its machine. The period of the fœtal life of plants is always limited: there is a precise time for the plants making their appearance above ground. When they are retarded by much rain or great drought, the fœtal plant loses the nourishing fluid food of the earth, becomes shrivelled and stunted in its growth, and frequently, decaying altogether, resolves back into its primitive state of crystallization: in this case, it never fails to assume a less perfect form, having been depreciated in quality by the abortive attempt at growth. The plant being formed, the earth expands by means of fissures and openings made in its surface. The shoots, with their enclosed sap, are sent forth with expanded mouths to the surface of the earth, to receive new life from the descending dew. The oxygen of the atmosphere gains entrance to the full-grown expiring fœtus; the heart once more resumes its elasticity; expansion takes place, and double circulation commencing for the first time, the fœtus becomes transformed into a living aerial plant, receiving food, colour, and motion from the external atmosphere.

The third life of the plant is for the formation of

its leaves,* branches, and flowers, and in this it becomes enabled to reproduce its species. The downward shoots, which formerly conveyed nutriment to the fœtal plant, are now appropriated to the purpose of vessels for carrying off all excrementitious matter, and depositing it in the earth, the matter thus deposited forming distinct roots feeding from the earth beneath. While the young plant is ascending into its new element, and preparing fresh seed for the continuation of its species, the old one or root is shooting downwards; and by so doing, it branches into the ground, and these branches

* "The leaves of plants have been compared to the lungs of animals, upon a very few slender analogies: but the additional offices known to be performed by leaves, show them to be also allied to the digestive and assimilating organs. Assuredly, the leaves of vegetables very generally perform the offices of animal stomachs; as when they convert the raw materials of vegetable nutriment into a new and peculiar substance for building up the fabric of plants."—*Sir Anthony Carlisle*, *Philos. Mag.* vol. xl. p. 41.

"The moisture which floats in the atmosphere is of the most essential use to vegetable life. The leaves of dying plants appear to act upon this vapour in its elastic form, and to absorb it. Some vegetables increase in weight from this cause when suspended in the atmosphere and unconnected with the soil, as the houseleek and the aloe. In very intense heats, and when the soil is dry, the life of plants seems to be preserved by the absorbent power of their leaves. It follows from what has already been said, that, with an increasing heat of the atmosphere, an increasing quantity of vapour will rise into it, if supplied from any quarter. Hence it appears that *aqueous vapour is most abundant in the atmosphere, when it is most needed for the purposes of life*, and that when other sources of moisture are cut off this is most copious."—*Whewell.*

become supporters to the young tree or plant above it.

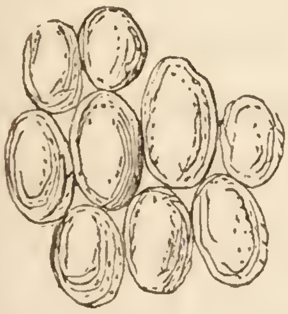
Thus have plants *two distinct modes of propagation at the same time: one* by the root from the earth beneath, forming *varieties* of its kind, while the *other* is by the young plant above, which is labouring for the continuation of its *own peculiar species!*

I cannot quit this interesting branch of the subject without a few observations on the prevalence of the primary shapes of matter in the organization of the vegetable kingdom. Whoever has studied it, must, on the perusal of the organization of the universe, depicted in the Second Chapter, be struck with the similarity of design. The heart form may be traced in a multitude of ways in the *leaves,* roots, buds, flowers, and interior organization of a variety of plants and vegetables; and the rings or lines, formed by the circulation and deposition of the fluid materials, are amply described, as well as the *axis* or gravitating line of the particular parts of the structure. Again, it is wonderful to observe how the aeriform portion of the plant is adapted for the reception of the vital fluid from above, those

> "Stars of morning, *dew-drops,* which the sun
> Impearls on every leaf and flower."—*Milton.*

"The simplest, and apparently the most elemen-

tary texture met with in vegetables, is formed of exceedingly minute vesicles, the coats of which consist of *transparent* membranes of *extreme tenuity*. The diagram is a highly magnified representation of the simplest form of these vesicles. But they generally adhere together more closely, composing by their union a species of vegetable *cellular*



tissue, which may be regarded as the *basis or essential component material* of every organ in the plant.* In their original state, these vesicles have an oval or globular form ; but they are soon transformed into other shapes, either by the mutual compression which they sustain from being crowded into a limited space, or from unequal expansions in the progress of their development. "Oval orifices, or *stomata*, as they have been termed, are discoverable on almost every part of the surface of the cuticle, but more especially in those that have a *green colour*. They are placed at nearly equal distances from one another, and are particularly numerous in the *cuticle* of the leaves, where they occupy the intervals between the fibres. These orifices conduct into the interior of the plant, probably into the general cavity of the intercellular spaces. It is evident, from the func-

* "From the simple cellular tissue all higher forms of organic texture are derived."—*Dr. Grant*.

tions they perform, that they must occasionally open and close; but the minuteness of their size precludes any accurate observation as to the nature of the apparatus provided for the performance of these motions. Amici describes their margins as formed by *two cells*, by the movements of which, combined perhaps with those of the adjoining cells, he conceives these orifices are opened and closed. Great variety, however, is observable in the structure of the stomata in different species of plants. Many plants have no stomata, either on the cuticle of the leaves or on that of the stem. This is the case with such aquatic plants as are habitually immersed in water. In those that are only partially immersed, stomata are met with in those parts exclusively which are above the water. The leaves of the *ranunculus aquaticus*, when made to grow in the air, acquire stomata, but lose them entirely when growing under water. Stomata are wanting in all plants whose structure is wholly cellular.

Fig. 1.

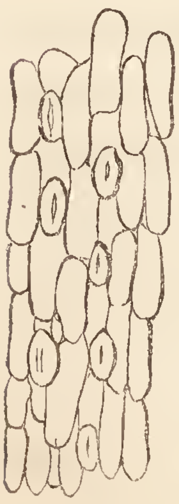


Fig. 2.

"Fig. 1 is a magnified representation of the appearance in the cuticle of the *lycopodium denticulatum*, taken in the central part of the lower surface of the leaf from De Candolle. Fig. 2 is a still more magnified view of the stomata in the leaf of the *lilium candidum*, from Amici."

"Botanists are far from being agreed as to the precise functions which the stomata perform. Their usual office, undoubtedly, is to exhale water; but they probably also absorb air under certain circumstances, and in particular exigencies."*

Animal life has had for its base the decomposed vegetable matter and dew: the decay of one race of animals erecting the basis of a new and improved species of living machinery. The carbon and dew falling upon the vegetable, occasions electricity to take place, when the oxygen is inhaled by the vegetable, and carbonic acid allowed to ascend into the surrounding atmosphere. By means of this electricity new forms of matter are produced, and animal life is generated. Wonderful to say, every individual flower or vegetable will produce an animal of finite dimensions,† which mode of propagation is illus-

* Dr. Roget.

† Dr. Darwin, in his Notes on the Botanic Garden, says, "I am acquainted with a philosopher, who, contemplating this subject, thinks it not impossible, that the first insects were the anthers or stigmas of flowers, which had, by some means, loosed themselves from their parent plant, like the male flowers of Vallisneria, and that many other insects have gradually in long process of time been formed from these; some acquiring wings, others fins, and others claws, from their ceaseless efforts to procure their food, or to secure themselves from injury. He contends, that none of these changes are more incomprehensible than the transformation of tadpoles into frogs, and caterpillars into butterflies."

"Allied to these simplest plants and animalculæ, are certain ambiguous beings, which, on the verge of both kingdoms, seem to belong indisputably to neither; for in them some of the most distinctive

trated by the orchis, of which the subjoined diagram is a specimen.

characteristic signs of animals and vegetables are so conjoined, that at times they would appear to be both, and again indifferently either. Thus, their germs take root and grow like ordinary plants, while the fruit they bear seems to be possessed of *voluntary motion*, and to pass, in its development, *through a stage of animal existence*, before it; in its turn takes root, and bears another generation. *Zoocarpes*, or fruit animalculæ, are the names which, not improperly, have been given to these connecting links of the animal and vegetable reigns."—*Professor Burnett's Outlines of Botany.*

Fly Tree, in natural history, a name given by the common people of America to a tree, whose leaves, they say, at a certain time of the year, produce flies. On examining these leaves about the middle of summer, the time at which the flies use to be produced, there are found on them a sort of bags of a tough matter of about the size of a filbert, and of a dusky greenish colour. On opening one of these bags with a knife, there is usually found a *single full-grown fly*, of the gnat kind, and a number of small worms, which in a day or two more have wings and fly away in the form of their parent. The tree is of the mulberry kind, and its leaves are usually very largely stocked with these insect bags; and the generality of them are found to contain the insects in their worm-state; when they become winged they soon make their way out. The bags begin to appear when the leaves are young, and afterwards grow with them; but they never rumple the leaf or injure its shape. They are of the kind of leaf galls, and partake in all respects, except size, of a species we have frequent on the large maple, or, as it is called, the *sycamore*."—*Encyclopædia Britannica.*

A serpent flower. The following is also an interesting example of the identity of animal and vegetable existence:—"Some Italian journals mention that a new organized being has been discovered in the interior of Africa, which seems to form an intermediate link between vegetable and animal life. This singular being has the shape of a spotted serpent. It drags itself along on the ground, and, instead of a head, has a flower shaped like a bell, which contains a viscous liquor. The flies and other insects, attracted by the smell of this juice, enter into the flower, where they are caught by the adhesive matter. The flower then closes, and remains shut until the prisoners are bruised and transformed into chyle. The indigestible portions,

(*a*) Ophrys apifera, the Bee orchis. (*b*) Ditto, tuberous root. (c) Flower separate, to show the insect form. [.(*d*) Ophrys muscifera, or Fly ophrys. (*e*) Tuberous root. (*f*) Flower separate.] (*g*) Aceras anthropophora, the green Man-orchis. (*h*) Root of the same. (*i*) (*i*) (*k*) Flowers separate, to exhibit their anthropomorphous appearance, as figured by Rudbeck.—*Professor Burnett.*

Thus has man, like the vegetable, a twofold mode of propagation. The first natural man has been created by dew dropped upon the flower of the vegetable; the second formed from himself.

It must be recollected that all matter is of animal origin: the vegetable and animal kingdoms, which cover the surface of our earth, form its boundary or skin; and this earth is but one organ of the universe, of which all the minute portions are uniting to produce one grand being of a superior or celestial order of creation.

such as the head and the wings, are thrown out by two lower spiral openings: this vegetable serpent has a skin resembling leaves, a white and soft flesh, and, instead of a bony skeleton, a cartilaginous frame filled with yellow marrow. The natives consider it delicious food."

CHAP. VI.

MAN.

> "Are not the mountains, waves, and skies, a part
> Of me and of my soul, as I of them?"—LORD BYRON.

MAN is a compound of the earth: his elementary particles are derived from the three kingdoms, animal, vegetable, and mineral; the proportions of each are arranged suitably and in accordance with his formation and structure. The atmosphere he is intended to breathe is composed of the same materials, and proportioned with as much exactness as himself: the earth has abundantly supplied him with all that is necessary for his support and safety. He may be with truth considered a moving machine, endowed with power to perpetuate his species.

This machine—man, is constructed upon strictly mathematical and architectural principles, both as to the time of its formation, and also to the purpose it is intended to perform; when completed and set in motion, it will continue that motion (barring accident) for seventy, or even one hundred years,

more or less, according to the age and quality of the material that formed its base and superstructure.

I have stated that the seeds of all matter are diamond. When these primitive particles become united into an ovum (the first state of animal existence,) they attract and adhere to each other,* friction is produced, and the fluid spark of active life elicited ;† fluids have not only the power of attraction, but also that of repulsion; heat, being the repellant power, causes expansion; and the lighter particles of the ovum being thrown to the surface, form the membrane of life which surrounds the first germ of animal structure, (see page 48 of this work.) This membrane has a galvanic action, or power of opening its mouth or cavity, and attracting matter analogous to itself. The galvanic action of the membrane is produced by vascular distention,

* "When two pieces of polished glass are pressed together, they adhere to each other, and it requires some force to separate them. This is said to depend upon the *attraction of cohesion.* The same attraction gives the globular form to drops of water, and enables fluids to rise in capillary tubes; and hence it is sometimes called capillary attraction. This attraction, like gravitation, seems common to all matter."—*Davy's Agricultural Chemistry.*

† "The ovum which is formed in the uterus immediately after impregnation, possesses within itself, not only the principles of vitality, but fluids which are appropriated to the purposes of organization. A vascular connexion at this time with the uterus would be of no service to the embryo, but the warmth and moisture which the uterus possesses are perhaps as essential to its growth as the warmth communicated to the egg during incubation."

Dr. Holland on the Physiology of the Fœtus, Liver, and Spleen.

causing the machine or heart to burst open. Thus heat and cold alternately act upon each other, the latter attracting, the former repelling. The simple muscle, once formed, is a complete animal of itself: it has the power of gradually enlarging its sphere of existence by adding link to link, and forming these links into layers, until a thick elastic tube or cave (the heart) is wrought, endowed with a multiplied power of action, (this first organ in the machine of man as well as every other being compounded of a series of animals, all united together.)

The heart of the fœtus is no sooner formed than it has its part to act, its power proportioned, however, to the increase of its particles. This primary organ is chained to, and receives its nourishment from, the placenta;* from it, it attracts and absorbs all the old materials which would otherwise be thrown off from the system of the parent. These materials are worked up into a new form of gelatin or plastic matter, suited to its own condition,† absorbing all that is necessary for growth, repelling all that is superfluous and foreign, which superfluous

* "When the vital actions have proceeded so far in the organization of the fœtus as to create, although imperfectly, the heart, the vena porta, and the aorta, the umbilical cord may be distinctly perceived, and it very soon establishes a connexion between the chorion and the uterus. When this union is fully established, the embryotic is changed into fœtal life."—*Dr. Holland on the Physiology of the Fœtus, &c.*

† "The *primordial* of all the parts of the body is a thin gelatinous mucus, in which the forms are laid."—*Sir Charles Bell.*

matter, when deposited, becomes a nucleus for other organs, and they in their turn attract particles of matter congenial with themselves. The red part, or fleshy muscle, being the centre, attracts the white part or fluid: both, like the primary, or heart, being enclosed by a membrane, which conveys into the interior of the muscle or organ nourishment to support life and growth. This membrane, after absorbing all that is fit for the embryo organ, repels the surplus matter to the circumference, forming new depositions. In this manner are organic machines of every size and form constructed, their stature and durability fixed: the brain, liver, lungs, and stomach, being all compounded of different materials, rejected and shot off at different periods by the heart of the fœtus. In forming the different organs of life, the heart shoots off its materials in vessels, (the arteries and veins,) the same as a tree or plant.* These vessels are open at their ends, and gradually grow narrower as they approach their destination, when they deposit the surplus matter with every fresh movement of the heart. The joints of the fœtus are formed in the same manner as the organs, each joint contracting, or becoming shorter by the inability or weakened vitality of its primary, the heart.†

* "There is no relation existing directly between or amongst the muscles themselves. We must therefore look for some means by which they are combined."—*Sir Charles Bell.*

† "Since vessels run through the cartilage to generate bone, we cannot suppose that these vessels are produced in the instant in which they appear to have existed."—*Sir Charles Bell.*

There are seven principal organs concerned in the construction of this most wonderful machine—man; without these seven organs, life could not be completed, (all other organs being secondary.) These seven principal organs all communicate with each other, and with their primary, the heart, by a double set of vessels (the veins and arteries), which vessels are not only empowered to receive surplus matter from the heart, and deposit it at the several organs, but also to convey to the most distant parts of the system, nourishment, to sustain life and growth. These elastic vessels give off an atmospheric fluid, which filters through their sides, forming the mucus. Thus is the membrane preserved from corrosion, otherwise it would lose its elasticity, become inflamed and irritable, and fever would be the inevitable result, by which the machine itself would suffer injury. The whole of the machine of man is a compound or continuation of vases, or organic vessels, each part having a double function to perform. Each organ has its boiling and freezing point, or a line of gravity peculiar to itself,* (see page 31 and 32 of this work,) and may be said to resemble a jette d'eau and filtering machine. While these organs filter through their sides or coat, they

* "There exists for the different organs a scale of extensibility, at the top of which are those which have the greatest laxity in the arrangement of their fibres, as the muscles, the skin, and cellular substance; at the bottom of the scale are those which are characterized by their density, as the bones, the cartilages, the tendons, and the nails."—*Bichat.*

are also throwing off from their upper surface (or cavity) a continual stream of boiling fluid diamond, by means of the veins and arteries, which material descending to its gravitating point, (the point of extreme cold,) forms fresh provisions for the organs or vessels beneath. Wherever the veins and arteries terminate, the nerves commence. These last have their origin in the uterus, and terminate in the brain. The deposition of matter in the uterus occasions a boiling electric fluid to arise from thence, which, forming vessels in pairs, ascends to elongate the spine, and finally deposits at the extreme point of ascension the material which constitutes the brain. Thus is kept up a constant connexion between the heart, uterus, and brain. The heart being the centre or balance, the uterus the weight or point of gravity of the fœtus, the brain may be considered the power or point of extreme levity. These three organs are not only the first constructed in the machine, but, through their means, life and growth are sustained, every injury to the fabric repaired, and the species preserved. Thus the old materials, which (if not thus arrested) would be thrown off from the system of the parent, are concocted in their receptacle, (the heart of the fœtus,) and branched off, according to the quality of the matter, to form new organs. The finest portion is sent to the brain; the coloured matter most probably forms the liver; the porous

or coke-like substance being appropriated to the lungs. Now, as these materials are communicated through the placenta from the mother, and conveyed by the umbilicus to their destination (the heart of the fœtus), it is evident that the fœtus does not want the use of a stomach; its primary organ performing that office. If then food does not pass through the stomach of the fœtus, bile will not be necessary to cause peristaltic motion; therefore, the liver as yet is inactive, there being no excrement to be carried off; the lungs also are not in motion, there being no external or atmospheric air to breathe.* Here then we find three of the principal organs not brought into action until the birth of the child—the lungs, liver, and stomach, and therefore the fœtus can have but *one* current or circulation,† that circulation evidently intended *for the formation and growth of the machine alone*, and the fœtus not having yet been exposed to the sun's rays, this circulation must be *white*, for *light* is essential to *colour*.‡ The organs must first have existence and

* Neither are the brain and uterus appropriated to their destined function.

† The returning circulation not commencing until after the birth of the child.

‡ The colour of the blood is given by the oxygen of the air or atmosphere. "The blood in crustaceous animals is *white;*—may not this circumstance arise, in part, from a less extensive or complete exposure to the influence of oxygen? *The more or less perfect manner in which oxygen is enabled to act, occasions all the diversities in the colour of the circulating fluid in warm blooded animals at different ages, and also all the varieties in the degrees of animal heat.*"—*Dr. Holland.*

growth before they can be extended and put in motion. Here then we find *two* distinct lives, the fœtal differing entirely from the locomotive. The former (which is *subsequent* to the conception of an ovum,) in which the animal is supported and kept up by the nourishment and warmth afforded by the mother: this life being intended for the growth and formation of the child, prior to its birth, by which means the fœtus or machine is prepared for the wear, tear, and casualties it is to encounter in a subsequent state of its existence.* Common reflection will tell us how necessary it must be, that such a complicated and finely formed machine as that of man should have time to thicken and cement the primitive organs to the arteries and

* "The instant at which the fœtus begins to exist is nearly that of its conception; but this existence, the sphere of which is every day enlarged, is not the same as that which the child is destined to enjoy after birth. The state in which the fœtus exists while in the womb has been compared to that of a profound sleep. Such comparison is inexact. In a state of sleep the animal life is only in part suspended. In the fœtus it has not commenced. We have seen, in fact, that this life is made up of the simultaneous or distinct exercise of the senses, of the nerves, of the brain, of the organs of locomotion, and the voice. Now in these different functions, every thing in such state is inactive." —*Bichat.*

"Now, we will take an example from the highest link of animal existence, or, if you will, the lowest; and descend from man to an insect. I take the double condition in which man is viewed by physiologists: that of the fœtus, and that of the adult. What is more extraordinary than the progression from the one to the other? Observe the child at the birth; that form is totally unlike the adult state. You know that the peculiar form which distinguishes the fœtus is positively and absolutely necessary to its safety at birth. You

veins that are afterwards to sustain such a velocity of motion as that given to the lungs by the atmospheric air.

As soon as the machine is perfectly articulated together, exactly to measurement and time, the size of every organ proportioned not a single day or hour beyond the period prescribed, a cloud comes over the amnios or fœtal atmosphere,* and deposits almost instantaneously a membraneous

see the frame grows in a particular manner up to the period of birth, which no sooner has taken place than another form is assumed, and upon that model man is constructed. Now, you do not merely see in the form of the fœtus, before any external influence can have operated, a provision for birth, but you discover in it phenomena of life; for the child in the womb has a life suited to the period of gestation; but when that period has arrived, it dies as effectually as if a creature that breathed here were put under water. Now if a woman have a tumour, there is no limit to that tumour: it goes on increasing until it takes life by destroying the powers of life, the drawing too plentifully upon the fluids of the mother. But at the period at which birth should take place, a convulsion is produced and the child dies. Why does it die? Because there is a provision, not only in all the internal organs of the heart, in the lungs, in the vessels, but in the life of the fœtus. It is provided that at a certain period the manner of that life should be changed, and, if it be not changed at the appointed time, the fœtus dies. You see here then a clear prospective provision, that, at a certain period, a certain change shall take place, *after the structure of the fœtus is formed.* You may take the simple fly, the larva creeping at the bottom of the pool. Now anticipate its period, take it up, and dissect it; you find its wings folded up curiously, you find them supplied with muscles, the muscles with nerves, the nerves with a source of energy. *Nothing of the kind has been put into use, but these things are prospective of the condition which the animal is to assume.*"

Sir Charles Bell, from the Lancet.

* "Towards the close of fœtal existence, the amnios becomes thick or loses its transparency."—*Holland on the Physiology of the Fœtus, &c.*

covering for the protection of the fœtus. This membrane, or true skin, is one continued muscle, being connected with every membrane throughout the machine, and is the elastic principle or life of man. This web of life, or elastic covering, surrounds every particle of the machine, unites these particles into organs, and when the frame is perfected, it encloses the whole internally and externally.

The atmosphere of the fœtus losing its elasticity, the fœtus loses its levity—life is suspended during its progress into a new world: the child does not die, but becomes asphyxiated.

Now, instead of the heart, veins, arteries, and lungs of the fœtus being oxygenated, as has hitherto been supposed, they are all filled with hydrogen, and the child comes into the world gasping for life with its mouth open. The error of anatomists has been in seeking to arterialize the blood of the fœtus; oxygenation, whether in plants or animals, must be progressive. Could anatomy have discovered the vital principle, then would it have been discovered long ago; the error has been in seeking for what could never be found in fœtal life: circulation of red blood does not take place in either animals or plants until they are exposed to atmospheric air: the arteries and veins, as I have said, are filled, not with oxygen, but with hydrogen gas; and the oxygen of the atmosphere coming in contact with

the hydrogen, inflates the lungs, and, with the utmost velocity, gives an impetus to the expiring heart.* It is in fact the contraction or condensation of the outward fluid amnios pressing the white blood (or hydrogen) back again into the cavity of the heart, which had rejected it, that causes an extraordinary effort in that organ to relieve itself, and, with one volcanic or muscular opposing effort, to throw the whole of its fluid contents to the outward surface.† Thus is given an impetus to the whole muscular frame of the almost exhausted fœtus, while the fluid repelled to the surface assists, like one immense wave of the ocean, to throw the helpless foundling babe on the shore of an unknown island. The first rush of atmospheric air into the lungs of a new born babe may be compared to the firing of a pistol or cannon, the flash of light certainly not seen, but felt throughout the frame, ere the cry of the infant pronounces *it lives.*

Organic or aeriform life commences with the pressure of the atmospheric air into the open mouth of the new-born babe, when instantaneous expansion of the lungs for the first time takes place; and with

* "It may be stated, as a universal law, that whenever venous becomes arterial blood, *air is received directly from without, and whatever is excrementitious is expelled directly from within.*"—*Holland.*

† "In asphyxia, the different organs do not cease to act because the heart has ceased to supply them with blood, but because it no longer supplies them with that sort of blood by which they can be stimulated."—*Bichat.*

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the first movement of the lungs, the air is, with the greatest velocity, sent into the cavity of the heart, there to meet with materials to supply and keep up silent combustion. These materials are rebounded off again from the heart in a fluid of living matter,* through every artery to the extreme parts of the system, there to be deposited, and rest until taken up again by the veins, and by them returned back to the heart. The arterial blood loses much of its heat in travelling from the heart; so that, when it arrives at the veins, it is no longer the same living blood; its elasticity is diminished by the loss of its heat: the blood returned to the heart through the veins is not organic, not living blood. In the manner we have described, at the first entrance into life, circulation commences: it begins at the mouth, is occasioned by the combustion of materials absorbed in the heart, and (barring accident) circulation will continue until the machine is worn out.†

The heart may be considered a real steam apparatus, and if it is not from time to time well supplied with fuel, the vessel will become languid, and cease to move; or, on the contrary, if supplied with too much fuel, the steam arising from the blood will increase, and, without great care to counteract the

* The blood, which has now become red.

† "The veins and arteries seem, by their continual motion, to resemble the agitation of fire; and when the heart of an animal is just plucked from the body, its palpitation is like a bursting flame."—*Cicero, of the Nature of the Gods.*

effect, by giving vent at the valves, the vessel will be rent asunder, and the machine shattered and destroyed.*

Every living animal is undergoing combustion, and, like man, the most perfect machine, moves about on the surface of this earth by atmospheric pressure. The difference between elasticity and irritability is, that the former belongs to, and is the life of the machine itself; the latter is the consequence of the machine being put in motion: muscular motion being that of the animal structure itself;† while locomotion is a foreign power, or

* "The *bulk* of the heart, compared to that of other parts, is *larger* in the *fœtus* than in the child that has breathed."—*Richerand.*

Dr. George Rees, in a lecture delivered at the Mechanic's Institution, February 20th, 1832, "gave a very familiar explanation of the operation of the vital principle, by comparing it with the steam engine. The steam, he said, might be considered the matter of life, and the movements of the machine, the functions of life. The suspension of vitality in the one case, or the moving power in the other, would render the machine useless, though the mechanism might remain complete. * * The basis of the doctor's theory appeared tobe that life is a proeess of eombustion, and the simple experiment of blackening a card by the flame of a candle conveyed to the audience a very intelligible idea of the mode by which carbon is thrown off from the surface of the lungs; for though, Dr. Rees observed, candles have not a plaee in the catalogue of modern luxuries, we eat substances whose chemical properties are of a similar kind, as carbon is the principal ingredient in all animal as well as vegetable matter."—*Globe.*

† "Many have been much puzzled in some doubtful matters relating to infants in the womb; as, whether in that station they have respiration, and whether their heart and arteries have pulsation; and consequently, whether the blood in the infant doth circulate; and whether the animal spirits exercise the same functions which they do

additional matter put into the animal to propel it forward, and move it in any particular direction.* Thus the heart which was the imbibing or sucking organ of the fœtal machine, changes its structure, and becomes also the forcing pump of the locomotive life.

after it is come out of the womb. I do conceive, the infant, as long as it continues in the womb, doth only live the life of a *plant*, and is like to a sucker that receives its growth from the tree, in receiving its nutriment and augmentation from the mother: it hath no respiration, or as little as can be imagined; and consequently, that its heart and arteries do not undergo any pulsation; neither doth the blood circulate in its vessels, nor do the animal spirits perform those functions they are intended for after the birth of the infant. The parts of the infant in the womb lying so compact and close, and every place filled up with humours, excrements, and internal air, there is no room left to admit air from without; especially being inclosed by two thick members, and a surrounding moat of serous humours: it being the external air forcing into the lungs is the chief cause of inspiration and expiration, as I have expressed before, that being excluded, there can be no respiration in the infant in the womb. What I have to say concerning the manner and causes of pulsation, may be best understood by a comparison to the sea; which (though it be in the calmest season) is subject to heave up and sink down, or to be dilated and contracted, as appears by its waves, which is not unlike the pulsation *Diastole* (dilatation,) and *Systole* (contraction) of the heart and arteries."—*The Vanities of Philosophy and Physic, by Gideon Harvey.*

* "With the fœtus, locomotion is not a portion of the animal life. I believe we may confidently assert, that in the fœtus the animal life does not exist, and that all the actions which take place at this age, depend upon the *organic life*. The fœtus, indeed, has nothing of the especial character of the animal. Its very existence is that of the vegetable; and its destruction can only be said to be that of a living body, not of an animated being. Thus in the cruel alternative of sacrificing the life of the mother, or that of the child, the choice cannot be doubtful."—*Bichat.*

CHAP. VII.

THE EARTH.

"A Living Being, considered as an object of chemical research, is a laboratory, within which a number of chemical operations are conducted; of these operations, one chief object is to produce all those phenomena which, taken collectively, are denominated Life; while another chief object is to develope gradually the corporeal machine or laboratory itself, from its existence in the condition of an atom, as it were, to its utmost state of perfection."

Berzelius's Traité de Chimie, tom. v., p. 1.

GEOLOGISTS who have given us theories of the globe we inhabit have always considered that it contained the same quantity of matter at the creation which it possesses in the present day. Now, to suppose this vast planet to have come into existence a full-grown body, is contrary to all known laws of matter. All things are progressive, and this earth of ours must have commenced its career in the universe under the governance of the same laws which we daily observe matter to possess: instead therefore of having been an immense body thrown off from the sun or a comet at one single stroke, and left to settle itself and become organized, no one knows how, for all conjectures have hitherto proved abortive, I shall endeavour to show, that, like all other moving bodies, it must have originated from

the most minute atom, and progressed in size to its present magnitude.* Do we not every where find animals and vegetables start into existence from the most imperceptible matter, and gradually rise up into form, and height, and width, and magnitude, moving about, and giving birth to beings like unto themselves; those beings commencing in the like manner their career, and progressing from a minute to a definite size, the standard of size as well as of their durability being dependent upon the quantity and quality of the matter forming the base of the superstructure?

All matter in this universe is of *animal* origin, and exists successively in three different states, which are the oval, the fœtal, and the locomotive. The solid is the first organized state of existence: in this condition matter is at perfect rest, and always oviform: the fluid is the second period in which the matter has active life, and acquires the heart-form: the aeriform or third stage is *locomotive*, and in this the animal is fully developed in its peculiar

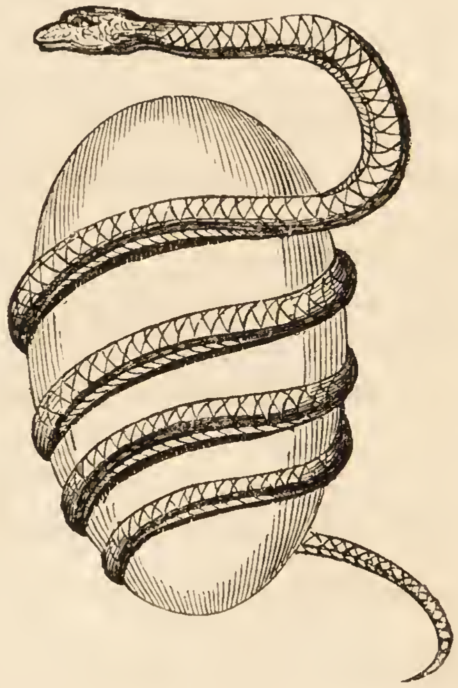
* "On tracing living beings to their origin, he (the naturalist) learns that every individual vegetable and animal takes rise from an atom of imperceptible minuteness, and *gradually increases in bulk* by successive accretions of new matter, derived from foreign sources, and by some refined, but *unknown* process, transmitted into its own substance. Then, following the *progressive* development of the organs, he observes them undergoing various modifications, as they are *assuming new forms*, which characterize certain *definite epochs in the general growth of the system*."—*Dr. Roget.*

shape, as the horse, the lion, the man.* These three stages of matter, although *successively* acquired by the animal, are always united in its machine. Thus, for example, in the egg, we have all three kinds, the solid, fluid, and aeriform, at once; but in the oval period, the solid predominates. In the fœtal life, the three are still combined, but the fluid or active principle is in excess; and in the third stage the triple combination is continued, but here the aeriform has the ascendancy over the two former, the solid and fluid. Solidity, fluidity, and elasticity form the basis of all living machinery; without solidity no seed or ovum could be formed; without fluidity no fœtal or organic body had been produced; without the aerial or elastic form of matter, locomotive machinery would never have been executed. The universe, as well as every portion, however minute, contained therein, exists at this present moment in these three several forms of matter: it is one extensive and continually progressing piece of moving machinery, composed of one elementary body, and governed by the primary law

* "In the moth, the butterfly, and indeed almost all the lepidopterous class, the entire insect, in the course of its very brief duration, undergoes not less than *three* distinct metamorphoses. From an egg it becomes a worm, from a worm an aurelia, from an aurelia an active and aerial fly. Its organs experience an equal variation, and receive and separate the vital gasses in an equally different manner; yet the animal itself continues the same, and loses nothing of its personality."
Mason Good.

of gravitation, originally impressed upon it by the First Great Architect.

The Earth, to which many writers have, like the great Kepler, assigned vital powers, being a part or organ of the fœtal universe, I shall assume to be governed by the laws of animal life, and in consequence compelled to pass successively through the oval, the fœtal, and the locomotive stages of existence.



The first of these periods terminated with the general deluge; the second is that under which the planet now progresses: the third it has not yet attained.

It was a favourite opinion of the ancients that the Earth originated in an ovum: an interesting example of the dawning light of truth, even in those apparently darkened ages of mankind; the subjoined diagram represents the famous Mundane Egg, "encompassed by the genial folds of the Agothodaimon, or good serpent, and suspended aloft in the temple of Hercules at Tyre."*

The primitive ovum, or foundation-stone, of our

* Maurice's Ancient Hindoostan.

"The elder Taut or Hermes, who flourished in Egypt near four hundred years before the second of that name, prime minister and counsellor of Osiris, held as an established maxim, that the world

planet was composed of diamond. This material (thrown off from the sun in an elastic state, in the manner described in pages 38 and 39 of this work,) was deposited in its most solid form at the point of extreme cold, (at that time the universal apex,) and was completely carbonized by the combustion it had undergone in its descent. Thus, the mundane egg was unlike solar matter in this respect, that, while the latter consisted of pure unadulterated materials, the former was enclosed or contaminated by carbon. In other words, the solar or celestial matter was composed of pure white, while the planetary consisted of pure *black* diamond.*

was oviform, and hence the oval figure of many of the temples of Egypt."—*Ibid.*

"It is Eusebius, in the third chapter of his Evangelical Preparation, who acquaints us that the Egyptians considered an egg as the apt symbol of the world, and from them this doctrine, together with many Eastern superstitions, was by Orpheus, in succeeding ages, introduced into Greece. This doctrine of the primeval egg, however, was neither peculiar to the Egyptians nor to the Indians, for the Phœnicians believed their Zophasemin, or the heavenly intelligences, which were the objects of their adoration, to be oviform, and, according to Plutarch, worshipped an egg in the orgia of Bacchus, as an image of the world. In the same traditionary opinion that the world was made from an egg, or at least bore a great resemblance to it, many other nations of the ancient world coincided, and they supported the propriety of the allegory, not only from the perfection of its external form, but fancifully extended the allusion even to its internal composition; comparing the pure white shell to the fair expanse of heaven; the fluid transparent white to the circumambient air; and the more solid yolk to the central earth."—*Ibid.*

* "In all flame, the light is chiefly derived from the charcoal. First gas is obtained, and then the charcoal deposited."—*Professor Brande.*

"Sir Humphrey Davy, by a strong and long-continued current

Solidity or hardness is the essential quality of primitive matter, and we have shown how this increases with its distance from the sun. It is therefore evident that if our earth's diameter be now considered 180°, its centre must have been in the first instance 90° farther distant from the sun, so that the matter composing the primary terrestrial ovum must have been as many degrees more crystalline in its

of the voltaic fluid, succeeded in producing a substance from a point of carbon, resembling in many respects the diamond. Its form was crystalline, and it possessed sufficient hardness to scratch glass; but it was black and opaque."—*Saturday Magazine.*

"M. Humboldt, in a treatise published 1801, supposes the solid parts of the earth to have been precipitated from a kind of gross and feculent atmosphere during the existence of a chaos. The idea is, indeed, fanciful; but the author's chemical facts and experiments are entitled to serious attention, and particularly those which relate to the quantity of carbon contained in common atmospheric air, here calculated at three-twentieths of the whole, and which seem to support the doctrine of oxigeneity of light."

Notes of Mason Good's Lucretius.

"Geologists who have speculated respecting the formation of the globe, have considered it as originally in a fluid state, either by the agency of fire or water; but the simplest form of matter with which we are acquainted is that of gas or vapour. Let us for a moment consider the elements of which all terrestrial substances are composed, as existing in this simple form when the fiat of Almighty power impressed upon the whole the various affinities by which they coalesced and formed a fluid or solid mass. During their union, intense light and heat would probably be evolved, presenting to the distant inhabitants of the universe the appearance of a star of great brilliancy, but of short duration. Nor are facts wanting to warrant this hypothesis: the sudden concretion of stony masses in the atmosphere, with the intense light evolved during their formation, may be analogous to the production of a planet.

It is well known to astronomers, that new stars have suddenly appeared with a brilliancy exceeding that of Jupiter. These stars

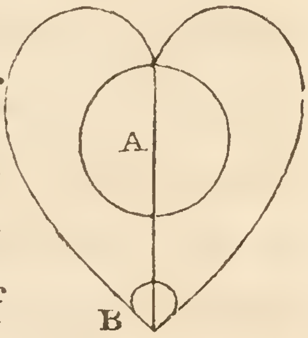
nature than that now deposited at the planet's surface, as dew or snow.* This ovum, *pro tempore,* the most minute and condensed atom in the universe,

were stationary, but their splendour diminished, and in a few years was extinct. Such was the star seen by Tycho Brahe in 1572, and by Kepler in 1604. Nothing like them has since been observed, nor has any explanation that I know of ever been attempted. The formation of a new planet, by the sudden concretion of gas expanded over a vast space, offers, I conceive, a probable solution of the phenomenon. Such a concretion might produce more light than the sun, or any of the fixt stars; for, wherever chemical combination is rapidly taking place, light and heat are evolved. It would not be difficult to pursue such speculations, and to imagine this concreted matter to become cometary or planetary, or to have a *succession of beds or strata produced by repeated concretions,* till the atmosphere alone preserved its gaseous state; nor would it require much ingenuity from such data to form a theory of the earth as consistent with existing appearances as any preceding hypotheses."—*Bakewell's Geology.*

* "The word crystal originally signified *ice,* but it was afterwards applied by the ancients to crystallized silica, or rock crystal; because, as Pliny informs us, they considered that body as nothing else than *water congealed by the action of cold.* At present it is employed to denote the regular figures which bodies assume when their particles have full liberty to combine by the laws of cohesion. *All the particles of bodies must be at liberty to move before they crystallize:* it is obvious we cannot reduce any bodies to the state of crystals except those which we are able to make fluid. Now, there are two ways of rendering bodies fluid—solution in liquid, and fusion by heat. These, of course, are the only methods of forming crystals in our power. There are many substances neither soluble in water nor other liquids, which notwithstanding are capable of assuming a crystalline form. This is the case with the metals, with glass, and some other bodies. The method employed to crystallize them is fusion, which is a solution by means of caloric: by this method *the particles are separated from one another, and if the cooling goes on gradually,* they are at liberty to arrange themselves into regular crystals.

"Romé de Lisle has shown that every body susceptible of crystallization has a particular form which it most frequently approaches. Bergman has demonstrated that this primitive form very often has

was fixed upon the line of universal gravitation, and likewise connected with the universal heart or sun, by means of two elastic veins, formed by the loss of heat in the descending particles. Darkness, we are told, was in the beginning upon the face of the deep, and the deep must obviously have been that portion of the universe placed beneath the sun's rays. (See the diagram, in which A represents the Sun and B the Earth, as originally deposited.) Such was the situation of our planet, during its oval state of existence: placed at the furthest extremity of the universal sphere, in a region of impure matter, it is evident that the light of the sun, if it reached the embryotic earth at all, could only have illumined its upper surface, so that it must have been in a comparatively darkened state. Thus, without light, heat, or motion, in a condition of temporary sleep or death, the adamantine mass must have acquired that perfect solidity which is essential to every animal seed.



"Creation sleeps. 'Tis as the gen'ral pulse
Of life stood still, and nature made a pause;
An awful pause! prophetic of her end."—*Young.**

been concealed in those very crystals which appear to deviate farthest from it; and Haüy has demonstrated, that *all crystals either have this primitive form, or at least contain it as a nucleus within them; for it may be extracted by a skilful mechanical division*."—*Mrs. Somerville.*

* "Mr. Addison, in his travels, elegantly remarks, that he never saw any statue of *sleep* that was not of *black marble*, alluding, doubtless, to the night, which is appropriated to sleep. All the statues of the

In this primary state of existence, matter possesses the laws of attraction and absorption: by the first law, the particles became united into an ovum; by the second, that ovum was enabled to increase in growth. By means of absorption, usually called the attraction of aggregation, all matter attracts its kind, and the egg receiving from above a constant supply of particles analogous to itself, must have absorbed these materials through its skin into the focus or centre of its body, as the nucleus of attraction.* Moreover, the egg, from its situation in the temporary boundary or universal zodiac, must have been exposed to some species of matter beyond the sphere of the celestial fœtus; thus the lower portion, that which was averted from the sun,

Nile, and in particular that fine one at present to be seen in the garden of the Vatican at Rome, are of black marble, emblematical of the colour of the Ethiopians, amidst whose lofty mountains that river has its source.

'Usque coloratis amnis devexus ab Indis.'"

Indian Antiquities.

"Animal charcoal destroys colour. You cannot bleach charcoal."

Mr. Brande.

* Seeds are incapable of germinating except when oxygen is present. In the exhausted receiver of the air-pump, in pure azote, in pure carbonic acid, when moistened they swell, but do not vegetate; and if kept in these gasses, lose their living powers, and undergo putrefaction."—*Davy's Agricultural Chemistry.*

"The absorption of oxygen by the seed in germination, has been compared to its absorption in producing the evolution of fœtal life in the egg; but this analogy is only remote. All animals, from the most to the least perfect classes, require a supply of oxygen."

Davy's Agricultural Chemistry.

must have received a supply of nutriment from some source, analogous to that of the human amnios.* (See pages 49 and 50 of this work.) In the manner described, the egg must have increased in density and bulk by the acquisition of fresh deposits of matter upon its surface. The primary stage of animal existence being intended to collect together a certain quantity of materials, forming a base or foundation-stone for the superstructure, our earth, prior to the flood, must have concentrated within its sphere every animal seed requisite for the production of the perfect machine of man. This accumulation of materials into one condensed focus, eventually caused such extreme pressure, that the electric spark of fluid life must have been elicited in the centre of the adamantine mass.†

* "The analogy between seeds and eggs has long been observed, and is confirmed by the mode of their production. The egg is known to be formed within the hen long before its impregnation; C. F Wolfe asserts that the yolk of an egg is nourished by the vessels of the mother, and that it has from those its arterial and venous branches, but that after impregnation these vessels gradually become impervious and obliterated, and that new ones are produced from the fœtus, and dispersed into the yolk. *Haller's Physiology*, tom. viii. p. 94.—The young seed, after fecundation, I suppose, is nourished in a similar manner from the gelatinous liquor, which is previously deposited for that purpose; the uterus of the plant producing or secreting it into a reservoir or amnios in which the embryon is lodged, and the young embryon is furnished with vessels to absorb a part of it, as in the very early embryon in the animal uterus."—*Dr. Darwin.*

† "Solid gems may include heterogeneous matter in them. Several instances of this sort, in opacous stones, I elsewhere recite, upon my own observation, but in *transparent* ones they are very great rarities;

Atoms or seeds, when compressed, generate

and therefore it will not, I presume, be thought strange, if I mention but a few.

"First then, on this occasion, I remember, that a very ingenious and qualified lady, who had accompanied her husband in an embassy to a great monarch, assured me, that she brought thence, among several rich presents and other rarities, (some whereof she showed me,) a piece of crystal, *in the midst of which there was a drop of water*, which, by its motion, might be very easily observed, especially when the crystal was made to change its posture. And, if my memory deceive me not, I have, in some pieces of rock-crystal, taken notice of things that seem to argue, that somewhat or other was intercepted within the body of the stone.

"A curious person that traded much, and was very skilful in Indian gems, particularly Grisolets, which he got from the Indies, and whereof he showed me the largest I have yet seen, being asked by me, whether he had ever found in them any heterogeneous substance, which something I had observed made me suspect that some of them might harbour, notwithstanding their hardness; he averred to me, that among divers rough ones that were brought from the Indies, he had with wonder seen one that was about the bigness of a filbert, in the solid substance whereof there was *a cavity with a certain liquor in it;* which by changing the posture of the stone might be made to move to and fro in the cavity: and when the drop was settled, it was of the bigness of a round pearl that he shewed me, which wanted somewhat of a moderate size for a necklace. And when he had answered the questions I proposed him to clear my doubts, he added, that this rarity made the stone, which was otherwise of a small value, prized at a hundred pounds: and I have myself seen a monstrous gem, if I may so call it, and little less a rarity than the former, that an acquaintance of mine had bought, (as I afterwards learnt,) from this relater; whose narrative about the Grisolet, I think the more credible, because that, having had the curiosity to break a stone that was brought as a rarity from the East Indies, where gems are often harboured in such stones, I found in the solid substance of it (which was so hard as to strike fire like a flint, and in its little flakes was at least semidiaphanous,) a cavity wherein were coagulated very minute but polished and crystalline stones, which seemed to have their points inwards, which argued that there had been some liquor, in which these glistering particles had shot, though in process of time the remaining and incoagulable part

heat; heat expands* and creates an atmospheric or elastic matter, which encloses or surrounds the fluid substance. Thus is life generated, and organization carried on. From the first spark of active life, elicited in the centre of the ovum, commenced a progressive ascent of animal and vegetable creation. The iron bond once broken, the vital principle once liberated, spark after spark of the crystal stream of life succeeds, each fluid drop creating its own atmosphere in its ascent to the boiling point or seat of active life in the ovum.†

of it may have been imbibed by the ambient matter, if not have escaped through it, by virtue of some peculiar congruity of it with the pores of the stone, which need not be thought impossible, since experience has assured us, that some solid stones and even gems may be (though slowly) penetrated or have their texture altered by common water. Nor are these the only heterogeneous substances I found included in this stone."—*Boyle's Essay on Gems.*

A German paper states that three diamonds were lately purchased at Algiers from a native, which were found in the golden sands of the Sumel, in the province of Constantine. Hitherto diamonds have not been known to exist in Africa. It is remarkable that here, as in the Brazils and Siberia, they are found in washing for gold. At present the opinion is that diamonds, like amber, may be formed, and are of very modern growth. It is not seldom that diamonds contain in the middle hard soft hollows, precisely of the same character as those of amber.

The Journal des Mines contains a notice that beds of amber have been discovered in the government of Wilna, (Russia;) and that large pieces of yellow amber are continually found by the peasants on the shores of the Szirwenka, which passes through the country.

* "Without heat all the matter of the world would be condensed into a point by the power of attraction; and neither fluidity nor life could exist."—*Dr. Darwin.*

† "Whilst making experiments on the optical structure of amber, Dr. Brewster was led to compare it with the diamond. He found

Had not every atom of fluid, as well as solid matter, been bounded, man could never have existed. Without an aeriform or elastic material to cement the solids, and to restrain the fluids, the particles of matter would float about in a state of confusion,

some singular analogies in the two substances, but one diamond which he examined presented a new phenomenon of a most unexpected kind, which, Dr. Brewster observes, is the only fact in the natural history of this body that promises to throw light upon its origin and mode of formation. The same phenomenon occurs also with amber. It is the existence of small portions of air within both substances, the expansive force of which has communicated a polarizing structure to the parts in immediate contact with the air. This structure is displayed by four sectors of polarized light encircling the globule of air, and can be produced artificially either in glass or in gelatinous masses, by a compressing force, propagated circularly from a point. It is obvious that such an effect cannot arise from any mode of crystallization; and if any proof of this were necessary, it might be sufficient to state, that I have never observed the slightest trace of it in more than 200 mineral substances which I have examined, nor in any of the artificial salts formed from aqueous solutions. It can, therefore, arise only from the expansive force exerted by the included air on the *diamond* and the *amber*, when *they were in such a soft state as to be susceptible of compression from so small a force.* That this compressible state of the diamond could not arise from the action of heat is manifest from the nature and the recent formation of the soil in which it is found, that it could not exist in a mass formed by aqueous deposition, is still more obvious; and hence we are led to the conclusion, rendered probable by other analogies, that the *diamond* originates like amber from the consolidation of, perhaps, vegetable matter, which gradually acquires a crystalline form by the influence of time, and the slow action of corpuscular forces.

"These results were obtained with flat diamonds regularly crystallized; but, on examining Mr. Allan's collection, Dr. Brewster found one of a perfectly octaedral form, having the same structure, and containing also an air-bubble of considerable size, which had produced, by its expansion, the polarizing structure already described."

The Doctor Magazine.

disorder, and chaos. By this elastic web, all fluids are bound and directed in their course: this plastic web surrounds every particle of matter, whether solid or fluid; it is this which stops the wave in its course, and bids the tide to flow so far and no farther.

> "Take but degree away,
> The bounded waters
> Would lift their bosoms higher than the shores,
> And make a sop of all this solid globe."—*Shakspeare.*

In the centre of the earth, then, it was that matter first became muscular, with what is now called galvanic action; there that the embryotic seeds of life first took root, and commenced their progressive ascent towards perfection; each of these primitive crystals, when awakened to an active state of existence, being one grade higher in the scale of life than its predecessor.* Thus, from the most simple lava, were produced, in succession, all the various types of creation, forming, in their progressive ascent, *a cavity of living matter*

* "An hypothesis has been advanced that the original creation of species has been successive, and took place in the order of their relative complexity of structure; that the standard types have arisen the one from the other; that each succeeding form was an improvement upon the preceding, and followed in a certain order of development, according to a regular plan traced by the great Author of the universe for bestowing perfection on his works. This gradation of structure was necessarily accompanied by a gradation of faculties; the object of each change of type being to attain higher objects, and to advance a farther step towards the ultimate ends of the animal creation. Many apparent anomalies which are inexplicable upon any other supposition, are easily reconcileable to this theory."—*Dr. Roget.*

in the upper portion of the solid ovum; all these diversified forms of matter, being comprehended in three grand classes, namely, those formed by the solid, those formed by the fluid, and those by the aeriforme species of matter.* Thus did matter

* "From the accurate experiments and observations of Spallanzani it appears that, in the Spartium Junceum, rush-broom, the very minute seeds were discerned in the pod at least twenty days before the flower is in full bloom, that is, twenty days before fecundation. At this time also the powder of the anthers was visible, but glued fast to their summits. The seeds however at this time, and for ten days after the blossom had fallen off, appeared to consist of a gelatinous substance. On the eleventh day after the falling of the blossom the seeds became heart-shaped, with the basis attached by an appendage to the pod, and a white point at the apex; this white point was on pressure found to be a cavity including a drop of liquor.

"On the twenty-fifth day, the cavity which at first appeared at the apex, was much enlarged and still full of liquor; it also contained a very small semi-transparent body, of a yellowish colour, gelatinous, and fixed by its two opposite ends to the sides of the cavity.

"In a month the seed was much enlarged, and its shape changed from a heart to a kidney, the little body contained in the cavity was increased in bulk, and was less transparent, and gelatinous, but there yet appeared no organization.

"On the fortieth day the cavity, now grown larger, was quite filled with the body, which was covered with a thin membrane; after this membrane was removed, the body appeared of a bright green, and was easily divided by the point of a needle into two portions, which manifestly formed the two lobes, and within these, attached to the lower part, the exceedingly small plantule was easily perceived.

"The foregoing observations evince, 1, that the seeds exist in the ovarium many days before fecundation. 2, That they remain for some time *solid*, and then a *cavity containing a liquid is formed in them.* 3, That after fecundation, a body begins to appear within the cavity, fixed by two points to the sides, which in process of time proves to be two lobes containing a plantule. 4, That the ripe seed consists of two lobes adhering to a plantule, and surrounded by a thin membrane,

ascend by its own purity, until it attained the summit of all organization, the machine—Man. Here prolific nature stops:—to make man, and to make him perfect is the end and aim of the Creator, himself all perfection.

> " Connexion exquisite of distant worlds!
> Distinguished link in beings' endless chain!
> Midway from nothing to the Deity!"—*Young.*

Man was created by the Almighty from his own substance, fashioned after his own frame; he stands upright, and superior to every other living animal; in his fabric may be found every other form in nature. The type of all living things, man, in this primitive state of his existence, was the monarch of all, both external and internal; every atom of his body being governed by the pure principle of attraction, was

which is itself covered with a husk or cuticle.—Spallanzani's Dissertations, vol. ii. p. 253."—*Dr. Darwin.*

" And I have divers times taken notice in such stones as the Bristol diamonds, that, though that part, which may be looked upon as the upper part of the stone, were curiously shaped, having six smooth sides, which at the top were as it were cut off sloping, so as to make six triangles, that terminated like those of a *pyramid* in a *vertex;* yet that which may be looked upon as the root or lower part of the stone was much less transparent (if not opacous), and devoid of any regular figuration; of which the reason seems to be, that this being the part whereby the stone adhered to its womb, it was sullied by the muddiness of it, and reduced to conform itself to whatever shape the contiguous part of the cavity chanced to be of; whereas the upper part of the stone was not only formed of the clearer part of the lapidescent juice before the waterish vehicle was exhaled, but had room and opportunity to shoot into the curious figure belonging to its nature."—*Boyle's Essay on Gems.*

as perfect as that of his Maker. Such was animal life in the terrestrial ovum, which had not yet undergone gravitation; and, agreeably to Holy Writ, God pronounced that his creation was good.* There was nothing then remaining to be performed: the sphere of life was complete; all things were in a state of rest, it was the seventh day, or sabbath of the Creator.

But what follows? God had permitted Adam and Eve to partake of the fruit of every tree but of that one which grew in the midst of the garden; for, "in the day that thou eatest thereof," said He, "thou shalt surely die." Adam and Eve disobeying this order, were cast out of their terrestrial Paradise, and consigned to labour and death. Death is the loss of that elasticity by which all animal mechanism is cemented together; by the loss of elasticity, the machine of man becomes disunited, or dissolved into its component parts, and gravitation takes place; hence the term carcass, from cado, "I fall, or gravitate."†

* "All pagan traditions embody the paradisiacal state of man in his days of innocence and happiness, justly deeming it the age of gold. He was an agriculturist, was nourished by simple fruits, and was fettered by no restraints of laws or social enactments; but the scene changed, vice and violence increased to that height, that a deluge swept away the apostate race, and cleansed the earth. These times of progressive corruption are marked by three metals, each deteriorating in value."—*Notes of Rameses, an Egyptian Tale.*

† Origin of the word Carcass: "It cometh of the verb *cado*, which signifieth to fall; if so, why may not the body of a living man be also

The atmosphere of the animals contained within the ovum was protected, by its skin or shell, from the intrusion of blight and disease: through the medium of that skin, the pure seeds of life were conveyed to the community within, and the carbon held at a distance.* When man, by disobeying his Creator, burst this silken bond, he was repelled, in consequence of his own act, to the surface of the ovum, his body became corrupt or diseased, progressive dissolution commenced, and he ultimately suffered the penalty of death.

Man did not only fall himself from purity, but exposed the whole creation to the inroad of the destructive principle:† a change in the animal

so called, as well as of a dead; for the one is already fallen, the other shall fall, and is falling continually."—*Petrarch's View of Human Life.*

* "The egg is covered within the shell, by a white and firm membrane, which contains no blood-vessels. The two layers of this membrane, which in other parts adhere closely to each other, leave at the large end a space which is filled with atmospheric air. This membrane includes the two whites of the egg, each of which is surrounded by a delicate membrane. The external of these is the most fluid and transparent, the inner one thicker and more opaque: they may be separated in eggs which are boiled hard. The internal white surrounds the yolk, which is contained in a peculiar membrane called the yolk bag."

Blumenbach.

† "If a seed be examined before germination, it will be found more or less insipid, at least *not sweet;* but after germination, it is always sweet. Its coagulated mucilage, or starch, is converted into sugar in the process; a substance difficult of solution is changed into one easily soluble; and the sugar carried through the cells or vessels of the cotyledons, is the nourishment of the infant plant."

Davy's Agricultural Chemistry.

"Mr. Hunter conceived that the difference between the putrid

kingdom must always be followed by that of the vegetable and mineral: "cursed is the ground for thy sake," said the offended Creator, "thorns and thistles shall it bring forth unto thee." Man, by his breach of the law of God involved a new creation, commencing with the imperfection and dissolution of matter; the seeds of disease becoming first developed in his own frame, and escaping to spread their ravages throughout the whole mass of living matter. All now becoming progressively corrupt, were gradually separated from the centre, and brought to the surface of the ovum by the new law of repulsion, forming there a parasitical race of their own production, which, from that moment to the present, has preyed upon the internal machine of the earth. The crust of this earth (like the outward covering of crustaceous animals), has arisen from a foreign body of corrupt matter, which does not belong to the animal body itself, but constitutes a

and the sweet egg depended upon the influence of life, which in the latter counteracted the chemical affinities, and prevented the matter from falling into a putrescent state. If then, said he, the matter of the egg has that property of life to check and control the affinities which all matter divested of life is subject to, has it also the power of resisting the changes of temperature? And now, upon comparing the putrid and the living egg, he found that the latter resisted freezing; and he thus showed that the property which resists putrefaction is allied to the property of the animal body which preserves it in a uniform heat, though exposed to the changes of temperature in surrounding bodies. We see by this that a portion of matter in an egg, or in a seed, shall be endowed with a principle, which, however obscure, we perceive by its effects."—*Paley's Natural Theology illustrated by Lord Brougham and Sir Charles Bell.*

class of disease by the decomposition of one or more of the internal organs: forcing its way through the surface or skin, this corrupt matter causes a constant annoyance and irritation to the internal animal, and a determination or resolution in its primary, the heart, to eject it to the exterior, or outward boundary of its own body. All irruptive diseases are thus occasioned by the continual repulsion of matter disagreeable and foreign to the nature of the animal, causing a crust or skin of various kinds. The newly created, or external race of animals, existing, first in the solid, then in the fluid, and lastly, the aeriform state, taking their origin in man's body, all the surface of the ovum has been peopled by him. From man's body, the first to oppose the perfect law of God, have originated the seeds of corruption and death: his creation ascends to perfect life, man's descends to corruption, disease, and death. Even in the present day,

> "Frail king of dust, man loves to look around
> And think,—'for me the elements abound
> With life and motion; shade and sunshine wait
> In mix'd attendance on my human state;
> Light, sea, and air their glorious spell maintain,
> That I alone as Lord of Earth may reign!'
> And yet, what art thou?—but a fleeting breath,
> A pulse of life that throbs away in death!"—*R. Montgomery.*

When God inflicted on our first parents the punishment of sin, He provided a means by which they might recover the state of purity and happi-

ness from which they were expelled. By the decomposition of man's body, we are provided with the scum or aeriform boundary of the ovum.* The particles of living matter, of which this was composed, all gravitating to the apex or electric point, these degraded animalculæ become reunited, by attraction, into the crystalline (or oval) form;† and thus is produced a foundation-stone for the organs of the fœtal earth. Electricity taking place, this new ovum becomes reorganized into an ascending or perfect race, its particles, first becoming developed as fœtuses, and lastly as locomotive animals, moving on the surface of the newly created sphere, in the interior of the body of our earth.‡ Meanwhile, fresh decompositions being carried on from above, gravitate to a certain distance beneath the last-

* "There is no such thing as the annihilation of an element in nature."—*Brande.*

† "Diminished temperature diminishes the power of sensation, and finally puts an end to it."—*Dr. Roget.*

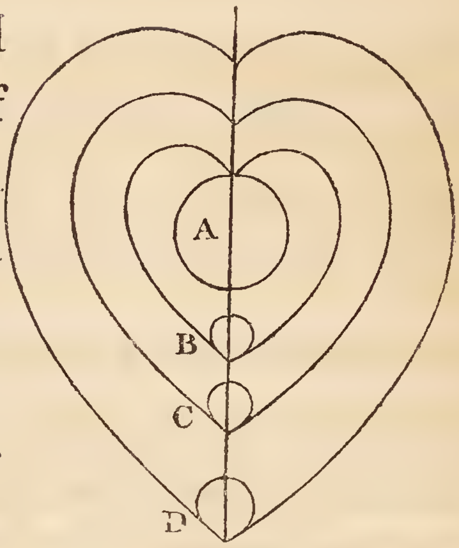
‡ Dr. Kirby, in his introduction to the Bridgewater Treatise, alludes to the physiological opinions of Lamarck in the following words: "The production of a new *organ* in one of these, so formed, animal bodies, he ascribes to a new *want*, which continues to stimulate; and of a new movement which that want produces and cherishes. He next relates how this can be effected. Body, he observes, being essentially constituted cellular tissue, this tissue is in some sort the matrix, from the modification of which by the fluids put in motion by the stimulus of desire, membranes, fibres, vascular canals, and divers organs gradually appear; parts are strengthened and solidified; and thus progressively new parts and organs are formed, and more and more perfect organizations produced; and thus, by consequence, in the lapse of ages monad becomes a man!!!"

formed mass, and forming a new deposit of matter, in a latent condition, as the nucleus for another organ enlarges the whole of the terrestrial sphere.* (See the diagram in which A represents the centre

* "The manner in which the pearl is supposed to be formed, throws much light on this subject. With respect to the formation of the pearl, the opinion of Reaumur, mentioned in the Memoirs of the French Academy for 1712, is the most probable, viz. that the parts are formed like bezoars, and other stones, in different animals, and are apparently the effects of a disease. In short, it is very evident that the pearl is formed by an extravasation of a glutinous juice, either within the body, or on the surface of the animal: the former case is the *most common.* Between one or two hundred pearls have been found within one oyster. Such extravasations may be caused by heterogeneous bodies, such as sand, coming in with the food, which the animal, to prevent disagreeable friction, covers with its glutinous matter, and which as it is successively secreted forms many regular lamellæ, in the manner of the coats of an onion, or like different strata of bezoars, only much thinner: this is probable; for, if we cut through the centre of a pearl, we often find a foreign particle, which ought to be considered as the nucleus, or primary cause of its formation. The loose pearls may originally have been produced within the body, and on their increase may have separated and fallen into the cavity of the shell. Those compact ones, fixed to the shells, seem to be produced by similar extravasation, occasioned by the friction of some roughness on the inside of the shell. These and the pearl-like nodes have a different aspect from the pearls, and are of a darker and bluer colour. *In the centre of all, I found a* FOREIGN PARTICLE.

"We may judge with greater or lesser probability by the appearance of the pearl-shells, whether they contain pearls or not. Those that have a thick calcareous crust upon them, to which *serpulæ* (sea-tubes) *Tubuli marini irregulariter intorti, Crista-gali Chamar lazurus, Lepas tintinabulum, Madreporee, Millipore, Cellipore, Gorgontæ, Spongiæ*, and other zoophytes are fastened, have arrived at their full growth, and commonly contain the best pearls; but those that appear smooth, contain either none, or small ones only."—*Account of the Pearl Fishery at Ceylon, by H. J. le Beck, Esq. communicated by Doctor Roxburg, Asiatic Researches, Vol. V.*

The extraneous body, which naturally serves for the nucleus,



or heart of the earth; B, C, and D the successive depositions of matter at the apex or north pole of its body.) Thus hath every animal the twofold mode of propagation, (analogous to the plant;) one from the external membrane or surface, the other from the internal membrane or ovum, (in the words of Dutrochet, the exosmose and endosmose.)*

"You look round on your mother earth,
As if she for no purpose bore you;
As if you were her first-born birth,
And none had lived before you!"—*Wordsworth.*

appears to be very often, or, as Sir E. Home says, always, a blighted ovum or egg. "If," says the enthusiastic baronet, "I shall prove that this, the richest jewel in a monarch's crown, which cannot be imitated by any art of man, either in the beauty of its form or the brilliancy and lustre produced by a central illuminated cell, is the abortive egg of an oyster, enveloped in its own nacre, of which it receives annually a layer of increase during the life of the animal, who will not be struck with wonder and astonishment?"

* "For we see in divers chemical solutions, as of salts and other bodies, that there are certain stages or periods of coagulation; so that, when such a quantity of the superfluous moisture is exhaled, especially upon any considerable refrigeration or other favorable circumstance, those particles that are most disposed to coagulation will convene and shoot into crystals, after which no more will do so, till a farther and more considerable evaporation of the water or other menstruum be made; upon which will ensue a new crystallization of the parts. And I can shew you the productions of a metalline, but uncommon solution, that I so made in an appropriated liquor, that the first shooting afforded me a layer or bed of curiously figured crystals, and the following, another layer of fine crystalline bodies, that have

Animals are but locomotive vegetables, Man himself, at the head of all creative matter, is but the active moving machine, to mould the internal man into form and substance. He has been the key-stone of the whole fabric, he has united and cemented it together, until it has progressed in size and power from the most minute to its present definite structure. As says the Psalmist: "*My substance was not hid from thee, when I was made in secret and curiously wrought in the lowest parts of the earth;* thine eyes did see my substance, yet being imperfect; and in thy book all my members were written, which in continuance were fashioned, when as yet there was none of them." Psalm cxxxix. 15, 16.

Man is the first, and will always be the last existing in every sphere; he has existed from eternity, and will continue to exist for ever. When he dies, his particles gravitate, to form the germ or ovum of a new sphere, and his individual body, (which is but a part of the new sphere,) when perfectly developed, is moving upon its circumference. All matter is thus of animal origin, and the ovum of this earth is the result of the decomposition, fall, or gravitation of animal matter, from the superior body, the sun or heart of the celestial fœtus. The matter which exists in the aeriform condition

fastened themselves to the former, but differ notably from them both in shape and posture."—*Boyle's Essay on Gems.*

at the sun's surface, when separated or thrown off, resolves itself into the component parts of all animal bodies, minute animalculæ. Of these simple forms of life all fluids consist. There is no such thing as unorganized matter in the celestial fœtus: its solid or mineral state being the seeds, or oval existence, of these simplest living machines; these primitive materials appear to be separated in order to be used as tools for the erection of a new order of animal creation. The ovum of this planet was constituted of an assemblage of the *descending* or lowest species of *celestial* animal materials, from which were produced all the primitive or *ascending* classes of *terrestrial* existence. The centre of every ovum, when it becomes oppressed by the surrounding parts, is kept in a continual state of combustion, constantly emitting a part of its body in direct lines upwards, which matter, after a certain time, gravitates to a new centre, where it remains stationary till awakened to active life, in the same manner as its predecessor. Thus is organization carried on till the creation is completed. Matter is all formed into concentric spheres,—every animal having a sphere of his own, is the monarch, and occupies the centre of that sphere. He creates all the beings that surround him, and they live on, and are continually moving about, the circumference of his body, forming spheres like to the primary

sphere. Thus, man's first triumph was over the single drop of water, in which, we are informed, as many animalculæ exist as there are animal beings on the surface of this now enlarged and highly organized earth.* Every animal existing in the first fluid drop of water in our planet was subjugated by man, and formed by him into one living globule or mass, the solid, the fluid, and the aeriform, over which he himself presided, on the most minute scale, in his own perfect form.†

Man, when originally organized, must have been perfect in his nature: he was formed from the purest diamond. Diamond is the most pure sub-

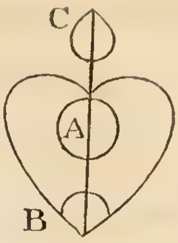
* "The recent observations of Professor Ehrenberg have brought to light the existence of monads which are not larger than the 24,000th of an inch, and which are so thickly crowded in the fluid as to leave intervals not greater than their own diameter. Hence he has made the computation that each cubic line, which is nearly the bulk of a single drop, contains 500,000,000 of these monads!—a number which equals that of all the human beings existing on the surface of the globe."—*Roget's Bridgewater Treatise*, vol. I., p. 13.

† "The origin of man from the sun, or the etherial heavens, and from water, are parts of an almost universal mythology, and form two of the grand pivots on which nearly every system of ancient idolatry appears to have turned."—*Good's Notes on Lucretius.*

"On a seal-ring of the king of Travancor, which consists of a very hard and valuable stone, the following words are inscribed: *Shri Padmanàbhen.* This is one of the sacred names given to *Veeshnu*, and contains an allusion to the birth of that deity. *Shri* signifies sacred, *Padma* denotes the *Nymphæa*, and *Nabhen* one who sits in the interior of this flower. The reader will recollect, from what has been before said, that the *Nymphæa* is a symbol of water, and of every thing created from it."—*M. Bartolomeo; (see Indian Antiquities*, vol. vii. p. 793.)

stance known: it is by gravitation that it has degenerated into carbon. Carbonic acid gas is the result of the combustion of diamond in oxygen, and this gas, arising from the decomposition of animal matter composing the surface of the earth, gravitates to its apex, and plants the foundation-stone of the several organs of the planet. Here then is deposited the black diamond in its crystalline form, as, in the first instance, it constituted the base of the terrestrial ovum itself. This matter becoming, by pressure, changed to its fluid state, liberates the diamond in its most pure and perfect form, which ascends from the apex or point of gravity to the opposite end of the line of gravitation, creating, by its levity, a current of ascending matter through the interior of the earth, and depositing, at a certain distance beyond the heart or centre, a new ovum of purified materials, in a crystalline form, consisting of the pure white diamond. This constitutes the base of the brain, or moon: between the uterus, or black diamond, and the brain or white, matter exists in every gradation of colour, form, and quality. The brain continues to increase in size and density, by the acquisition of repeated layers of matter from the same source. These are supplied from the surface of the earth to the uterus or gravitating point, as before described. The current by which the brain is formed and sustained, is represented in

the subjoined diagram, in which A is the centre or heart, B the uterus or gravitating point, and C the brain or point of extreme levity.*



Each fresh layer, or deposit, being attracted and absorbed by the brain, pressure or electricity in that organ eventually took place, and it commenced its fluid or fœtal stage of existence, forming, by its repulsion of the ascending matter, a counter-current, and forcing those materials down again towards their gravitating point, the uterus.

This earth, we have said, is a part or organ of the universe. The organs of all animal bodies are formed upon the same principle, each part being complete in itself. The heart, uterus, and brain exist in every portion, however minute, in the scale of life. The heart is the first formed, then the uterus, which answers to the North Pole, or lower extremity, the apex. Here gravitation ends, and by attraction, the degraded materials

* "If we examine the embryo of an animal in its earliest stage, we shall still find it to contain the rudiments of three great systems; for it will be seen to consist of distinct layers, one over the other, of membranous substance, whereof the first becomes gradually elevated until it forms the spinal chord and brain; the second resolves itself into the bony and muscular systems and the great viscera; and the third into the organs of respiration, the stomach and the glands connected with them. Connected with the three membranes there is a little red spot called the punctum saliens, which appears to flash with light as it alternately contracts and expands. From this is formed the heart."—*Mr. Green's Lecture at the Royal Academy, November* 14, 1831.

commence an ascending or superior life, (that of the internal or celestial man.)

The living race of ascending matter in the ovum had been propagated by the pressure of the falling dew: but man being cast out, in consequence of his sin, to the surface, was now reproduced on the descending scale from himself;* the race multiplying on the face of the earth, not by attraction and addition to, but by separation from, the parent stem.† Man himself being first on the list of parasites, all the bodies produced from him, constituting a class of disease, or crustacea of the internal machine—the Earth.

The first germs of life, when expelled from the interior of the ovum, became the inhabitants of that portion of the surface most adapted to prolong their existence: this was the upper or galvanic end.‡

"Earth fed the nursling, the warm ether cloth'd,
And the soft downy grass his couch composed."—*Good's Lucretius.*

Man's atmosphere, in this earliest epoch of his

* "It is clearly ascertained, that the oviparous quadrupeds are found considerably earlier, or in *more ancient strata,* than those of the viviparous class."—*Cuvier.*

† "The infusoria are propagated, besides the highly probable egg formation, not by buds as in plants, but also distinctly by *separation.*"—*Professor Ehrenberg on Fossil Infusoria.*

‡ "M. Baillie supposed with Buffon, Linné, and several others, that the earth, previous to the formation of the human race, had been in a state of fusion; that it had gradually cooled, and that the cold was by very slow and imperceptible degrees gradually increasing.

existence, must have been of a considerably finer and more pure description than in subsequent periods, (the atmosphere being always commensurate with the material or base whence it proceeds;) thus, less impediment must have existed to the deposition of the vital stream from above. This comparative purity of the atmosphere would occasion the wonderful longevity to which the patriarchs of our race attained, prior to the flood:*

From a very close attention to the nature of the ancient mythologies, all which are intimately connected with astronomy, they imagined that man had been created, and that the arts and sciences had taken their rise, not far from the arctic circle, where the earth had first cooled, and that they had extended southwards, as it by degrees became more and more cold."—*Higgins's Celtic Druids.*

* "It was proved long ago by Boyle, that animals cannot live without air, and by Mayow that they cannot breathe the same air for any length of time without suffocation. Dr. Priestley and several other philosophers have shown us, that animals live much longer in the same quantity of oxygen gas than of common air. Count Morozzo placed a number of sparrows, one after another, in a glass bell filled with common air, and inverted over water.

	H.	M.
The first sparrow lived	3	,,
The second . .		3
The third . .		1

He filled the same glass with oxygen gas, and repeated the experiment.

	H.	M.
The first sparrow lived	5	23
The second . .	2	10
The third . .	1	30
The fourth . .	1	10
The fifth . .		30
The sixth . .		47
The seventh . .		27
The eighth . .		30
The ninth . .		22
The tenth .		21

there being no rain before that period, for we are told that the earth was watered by a mist, which went up from its own surface. (Genesis, ii. 5, 6.) Thus there could have been no thunder and lightning to affect his health; neither do we find any reason to believe that men dwelt in houses, as they have done subsequent to the deluge; so that the solar fluid must have had originally little or no impediment to its deposition. These and many other reasons may be given, to account for the great age these primitive living beings attained, which to us, their descendants, appears almost incredible.*

From the most minute form, man, in this earliest period of the earth's existence, must have progressed to the size and strength of a giant: indeed, from both the Scripture and profane history, we learn that man actually was a giant in those days, his frame corresponding to the solidity of the planet on which

He then put in two together; the one died in twenty minutes, but the other lived an hour longer."—*Thomson's Chemistry.*

* The ages of these fathers of our race are recorded to have been as follows, (see Genesis, v.):

	years.
Adam	930
Seth	912
Enos	905
Cainan	910
Mahalaleel	895
Jared	962
Enoch	365
Methuselah	969
Lamech	777
Noah	950

he dwelt.* Organization always progressing with its base, it is clear that, as the interior of earth be-

* "Besides all these famous giants found in profane history, (which I will reserve to accompany the giants of Albion, in the story of Britany,) the Scriptures do clearly and without all allegorical construction avow, that, besides Nimrod, there were found of these giants, in the time of Abraham, of Moses, of Joshua, and of David; namely the Rephaims in Asteroth; the Zuzæi or Zanzummims in Ham, and the Emims, which dwelt anciently in the land of Moab: whom Moses (for stature) compareth with the Anakims, which dwelt in Hebron; for they also were taken for giants as the Anakims: likewise, where Moses speaketh of the land of Ammon, he useth these words, *that also was taken for a land of giants, for giants dwelt therein aforetimes: and whom the Ammonites call Zanzummims; a people that was great, and many and tall as the Anakims.* And these giants, called Rephaims, in Asteroth and Kernaim, and the Zuzæi or Zanzummims, Chedorlaomer king of Elam overthrew, assisted by other kings, his associates. Also the prophet Amos found among the Ammonites, men of giant-like stature, whom he compareth to the cedar, and whose strength to the oaks; and the prophet Baruch, *these were the giants famous from the beginning that were of so great stature, and so expert in war.* Particularly it is written of Og, king of Basan, that his bed of iron was nine cubits long, and four cubits broad; for only Og king of Basan remained of the remnants of the giants, who commanded the kingdom of Basan, four hundred years after the expedition of Chedorlaomer. Moreover those discoverers and searchers of the land of promise (sent by Moses from Cadesbarre in Paran) made report, at their return, of the great stature of those people in general, and especially of the sons of Anak, in these words. *All the people which we saw in it are men of great stature; for there we saw giants, the sons of Anak, which come of the giants, so that we seemed in our sights like grass-hoppers, and so we were in their sight;* that is, the searchers found in their own judgments a marvellous difference between the Anakims and themselves; insomuch that the Israelites were so stricken with fear, as they rather sought and desired to return again into Egypt, and were more willing to endure their former slavery, than to fall by the strokes of those fearful nations. Furthermore, the scriptures put us out of doubt, that Goliah the Philistine of Gath was a giant of six cubits and a span long: the armour which he wore weighed five thousand shekels of brass: the shaft of his spear was like

came changed, from the solid to the fluid state, by the iron and carbon being gradually brought to the surface of the mass, the interior must have become more and more leavened, the surface increased in density. This surface must have consisted of an elastic cement, forming the base and crust of every living animal. Thus

> "Man's first sons as o'er the field they trod
> Reared from the hardy earth, were hardier far;
> Strong built, with ampler bones, with muscles nerv'd
> Broad and substantial."—*Good's Lucretius.*

The primitive machinery, partaking of the solidity

a weaver's beam, and his spear-head weighed six hundred shekels of iron. Also, in Samuel there is mention of another Goliah, sirnamed Getheus, because he was of Gath; and of three other giants; of which the first was slain by Jehonathan, David's nephew, who had twelve fingers, and as many toes: a man of great stature, and his fingers were by sixes, even four and twenty.

"Also that Sampson was of surpassing strength no man doubteth, who tore a lion as it had been a kid, and after slew thirty of the Philistines, and (after that) a thousand more of them with a jaw-bone of an ass; and lastly, he took the gates of Azzah and the two posts, and lifted them away with the bars, and put them upon his shoulders, and carried them to the top of the mountain before Ebron. If then it be approved by every judgment, that both nature and the heavens wax old, and that the great age of time hath (with itself) enfeebled and almost worn out the virtue of all things, then I say, that as in all other kinds the earth (before that sin had increased the curse and corruption,) brought forth her young ones more strong and beautiful than it did in after ages, so also those giants, those mighty men, and men of renown as far exceeded the proportion, nature, and strength of those giants remembered by Moses of his own time, and after him their successors, as the ordinary proportion of all men in general, soon after the flood and in times far off, exceeded the bulks and bodies of men which are now born in the withered quarter and winter of the world: if therefore giants were common in the third and fourth age, much

of the surrounding elements, must have consisted chiefly of iron and carbon; men and animals must have been large boned and strong, their size and strength increasing in proportion to the solid materials acquired from the heart or centre of the earth.

Thus, as the race diverged from the south towards the North Pole, we find the white diamond losing its original purity, and passing through every gradation in colour, until it attained the darkest shade. It is more than probable that Noah himself was a perfectly black man.*

During this embryo state of his existence, the mind of man must likewise have gradually attained a completely darkened state: while an inhabitant of the pure centre of the ovum, his light and heat were derived from its internal source; but when

more in the first flourishing youth and newness of the world. But the wickedness (especially in cruelty and oppression) of these men was such, as God therefore by the flood gave end to all flesh, but to the just Noah and his family."—*Sir Walter Ralegh's History of the World.*

* Mr. Pinkerton, speaking of the interior of Borneo, of which little is known, says, "These wild countries are peopled with an infinite number of monkeys, besides the Orang Hoetans: these real satyrs walk on their hind legs, and have a perfect resemblance of mankind; other species are found white as snow, and some entirely black." * * * This animal "is said to light a fire by blowing with its mouth, to broil fish, and boil rice; so that man is not the only cooking animal."

"The ancient Egyptians were real negroes, of the same species with all the natives of Africa; and though, as might be expected, after mixing for so many ages with the Greeks and Romans, they have lost the intensity of their first colour, yet they still retain strong marks of their original conformation."—*Volney.*

expelled to the surface of the mass, he became subject to the darkness of the region in which he was placed: his light was now obtained from the stars alone;* of the sun he must have known far less than we now do in the coldest winter; being wholly unacquainted with the seasons, as subsequently developed by the earth in its rotation round that sun; his existence identified with an apparently minute portion of the earth on which he dwelt; his mind, chained to the objects immediately around, was inferior, by very many degrees, to the capacity of those black races now in existence, commonly deemed so nearly on a level with the brute creation. The animals around man being also natives of this darkened sphere must have been tame and easy of control, ignorant of the fierce passions, by which they have been animated, since the general deluge.†

* Beetles and animals which never approach daylight are almost totally black.

"Were it not for the reflective and scattering power of the atmosphere no objects would be visible to us out of direct sunshine; every shadow of a passing cloud would be pitchy darkness; the stars would be visible all day, and every apartment, into which the sun had not direct admission, would be involved in nocturnal obscurity."

Sir J. Herschel on Astronomy—Cabinet Cyclopædia.

† Captain Cook gave the following account of the animals at Staten Island, near Cape Horn.—"The sea-bears are not so large, by far, as the lions, but rather larger than a common seal. They have none of that long hair which distinguishes the lion. Theirs is all of an equal length, and finer than that of the lion, something like an otter's, and the general colour is that of iron-grey. This is the kind which the French call sea-wolves, and the English seals; they are, however, different from the seals in Europe and North America.

Darkness is the cause of all deformity, of both mind and body;* we may, therefore, easily account for the singular monumental figures of the Egyptians,†

The lions may too, without any great impropriety, be called overgrown seals; for they are all of the same species. It was not at all dangerous to go among them; for they either fled or lay still. The only danger was in going between them and the sea; for if they took fright at any thing, they would come down in such numbers, that, if you could not get out of their way, you would be run over.

"It is amazing to see how the different animals which inhabit this place are mutually reconciled. They seem to have entered into a league not to disturb each other's tranquillity. The sea-lions occupy most of the coast; the sea-bears take up their abode in the Isle; the stags have post in the highest cliffs; the penguins fix their quarters where there is the most easy communication to and from the sea; and the other birds choose more retired places. Captain Cook says, he has seen all these animals mix together like domestic cattle and poultry in a farm-yard, without one attempting to molest the other."

* *Effects of Darkness in Producing Deformity.*—"A correspondent writes us the following curious fact. There are about the French metropolis a number of beggars, twelve or thirteen of them at least, all deformed in various ways; all were born at Lille, in certain dark caverns under the fortification. The effect of these places, from their want of light, producing malformed births, is so notorious, that the magistrates of Lille have issued strict orders to prohibit the poor from taking up their abode in them. It is added by our correspondent, that he had a conversation with Mr. Edwards on the subject, and that gentleman was greatly struck with the confirmation which the above circumstances afford to his views, stated in his work *Sur l'Influence des Agens Physiques sur l'Homme.* Mr. Edwards' experiments of detaining tadpoles in darkness, and thus causing them to grow into gigantic and motionless tadpoles, instead of being transformed into frogs, are well known."—*Medical Gazette.*

† "Learned men may be permitted to employ their time and ingenuity in attempts to decipher the mystic knowledge contained under the form of the Sphynx of Thebes, the Pegasus of Thessaly, the Minotaur of Crete, or the Chimera of Epirus; but it would be folly to expect seriously to find such monsters in nature. We might as well endeavour to find the animals of Daniel, or the beasts of the

and other ancient races, which, appearing to us as mutilations, must be real types of the beings which,

Apocalypse, in some hitherto unexplored recesses of the globe." "Neither can we look for the mythological animals of the Persians,—creatures of a still bolder imagination,—such as the *martichore*, or destroyer of men, having a human head on the body of a lion, and the tail of a scorpion; the *griffin*, or guardian of hidden treasures, half eagle and half lion; or the *cartazonon*, or wild ass, armed with a long horn on its forehead."—*Cuvier.*

"It is shown that animals formerly existed on the globe, being unknown varieties of *species* still known; but it also appears that *species* existed, and even *genera*, wholly unknown for the last five thousand years. These peopled the earth, as it was, not before the general deluge, but before *some convulsion* long *prior* to that event had overwhelmed the countries THEN DRY, and raised others from the bottom of the sea. In these curious enquiries, we are conversant not merely with the world before the flood, but with a world which, before the flood, was covered with water, and which in far earlier ages, had been the habitation of birds, and beasts, and reptiles. We are carried, as it were, several worlds back, and we reach a period when all was *water*, and slime, and mud; and the waste, without either man or plants, gave resting place to enormous beasts, like lions and elephants, and river horses; while the water was tenanted by lizards, the size of a whale, sixty or seventy feet long, and by others with huge eyes, having *shields* of *solid* bone to protect them, and glaring from a neck ten feet in length; and the air was darkened by flying reptiles covered with scales, opening the jaws of the crocodile, and expanding wings, armed at the tips with the claws of the leopard."

Paley's Natural Theology, illustrated by Lord Brougham.

"A short time since, a cavern was discovered in England, which contained prodigious numbers of hyenas, of all ages, and in the soil even the excrements were plainly to be recognized. They must have lived there for a long period, and they had dragged into their cave the bones of the elephants, rhinosceroses, hippopotami, horses, oxen, deer, and of various glires which are there mingled with their own remains, and bore evident marks of the tooth of the hyenas. But what must have been the soil of England when these enormous animals served as prey to these ferocious beasts?"—*Cuvier.*

"That the face of the globe has successively undergone total

at that period, existed in nature. "The stranger who visits the gallery of sculpture in the British Museum, cannot fail to be struck with the curious collection of objects in the room of the Egyptian antiquities. Passing from the contemplation of the almost faultless representations of the human form in marble, the triumph of Grecian art, he comes to figures more remarkable from their singular forms and colossal size, than for their beauty. Though the contrast between what he has just left, and the scene to which he is introduced, creates, at first sight, no pleasing impression, feelings of curiosity

changes at different remote epochs is now a fact beyond all dispute; as also, that, long anterior to the creation of man, this world was inhabited by races of animals, to which no parallels are now to be found; and those animals themselves only made their appearance after the lapse of ages, during which no warm-blooded creatures had an existence. It has been further remarked by zoologists, that the animals which first appeared in these latitudes, were analogous to such as now inhabit tropical regions exclusively; and that it was only at a period immediately before the creation of the human race, that species similar to those of the existing era began to appear in northern latitudes. Similar peculiarities have been also found to mark the vegetation of corresponding periods. It would hardly be credited, by persons unacquainted with the evidence upon which such facts repose, that, in the most dreary and desolate northern regions of the present day, there once flourished groves of tropical plants of Coniferæ, like the Northfolk Island and Araucanian pines, of bananas, tree ferns, huge cacti, and palms; that the marshes were filled with rush-like plants, fifteen or twenty feet high; the coverts with ferns like the undergrowth of a West Indian island; and the vegetation, thus inconceivably rich and luxuriant, grew amidst an atmosphere that would have been fatal to the animal world. Yet nothing can well be more certain, than that such a description is far from being overcharged."—*Lindley and Hutton's Fossil Flora.*

and admiration soon arise from a more careful examination of what is around him. The colossal dimensions in which some figures are exhibited, the hardness of the materials employed, and the strange combination of the human and the animal form, all unite in exciting an intense desire to know in what country, and in what age of the world, such marvellous specimens of the human race were produced. When he is told that these are but a few examples of the wonderful works that still exist in Egypt; that other European capitals, (Rome, Turin, Paris, and Berlin,) have all their galleries enriched from the same source, or their public places ornamented by them; that the ancient tombs and temples of that country still furnish inexhaustible materials to enrich our museums, and gratify the curiosity of the antiquary—he will at once perceive that a mere knowledge of the names assigned to these pieces of stone would convey no information at all, and that any description of them must be unintelligible, if it does not connect with the country from which they come, and the monuments of which they are part."*

* Captain Cook, in his Voyage towards the South Pole, relates that on the east side of Easter Island, near the sea, "they met with three platforms of stonework, or rather the ruins of them. On each had stood four of those large statues, but they were all fallen down from two of them, and also one from the third; all except one were broken by the fall, or in some measure defaced. Mr. Wales measured this one, and found it to be fifteen feet in length, and six feet broad

It is more than probable, that, when the whole mass of this earth became loosened from its situa-

over the shoulders. Each statue had on its head a large cylindric stone of a red colour, wrought perfectly round. The one they measured, which was not by far the largest, was fifty-two inches high and sixty-six feet in diameter. In some the upper corner of the cylinder was taken off in a sort of concave quarter round, but in others the cylinder was entire. They observed that this side of the island was full of those gigantic statues so often mentioned; some placed in groupes on platforms of masonry; others single, fixed only in the earth, and that not deep, and these latter are, in general, much larger than the others. Having measured one, which had fallen down, they found it very near twenty-seven feet long, and upwards of eight feet over the breast or shoulders; and yet this appeared considerably short of the size of one they saw standing: its shade, a little past two o'clock, being sufficient to shelter all the party, consisting of nearly thirty persons, from the rays of the sun.

"The gigantic statues, so often mentioned, are not, (continues Captain Cook,) in my opinion, looked upon as idols by the present inhabitants, whatever they might have been in the days of the Dutch; at least, I saw nothing that could induce me to think so. On the contrary, I rather suppose that they are burying-places for certain tribes or families. I, as well as some others, saw a human skeleton lying in one of the platforms, just covered with stones. Some of these platforms of masonry are thirty or forty feet long, twelve or sixteen broad, and from three to twelve in height; which last in some measure depends on the nature of the ground. For they are generally at the brink of the bank facing the sea; so that this face may be ten or twelve feet or more high, and the other may not be above three or four. They are built, or rather faced, with hewn stones of a very large size; and the workmanship is not inferior to the best plain piece of masonry we have in England. They use no sort of cement; yet the joints are exceedingly close, and the stones morticed and tenanted one into another, in a very artful manner. The side walls are not perpendicular, but inclining a little inwards, in the same manner that breast-works, &c. are built in Europe: yet had not all this care, pains, and sagacity, been able to preserve these curious structures from the ravages of all devouring time.

"The statues, or at least many of them, are erected on these plat-

tion by the general deluge, the elastic fluid element covered every living animal, and, enveloping them within its grasp, converted them into one petrified substance,* and thus that the figures or monuments

forms, which serve as foundations. They are, as near as we could judge, about half length, ending in a sort of stump at the bottom, on which they stand. The workmanship is rude, but not bad; nor are the features of the face ill formed, the nose and chin in particular; but the ears are long beyond proportion; and, as to the bodies, there is hardly any thing like a human figure about them.

"I had an opportunity of examining only two or three of these statues, which are near the landing-place; and they were of a grey stone, seemingly of the same sort as that with which the platforms were built. But some of the gentlemen, who travelled over the island, and examined many of them, were of opinion that the stone of which they were made, was different from any other they saw on the island, and had much the appearance of being factitious. If the stones are factitious, the statues might have been put together on the place, in the present position, and the cylinder put on by building a mount round them, as above mentioned. But, let them have been made and set up by this or any other method, they must have been a work of immense time, and sufficiently shew the ingenuity and perseverance of the islanders in the age in which they were built, for the present inhabitants have most certainly had no hand in them, as they do not ever repair the foundations of those which are going to decay. They give different names to them, such as Gotomoara, Marapate, Kanaio, Goway-too-goo, Matta Matta, &c. &c.; to which they sometimes prefix the word Moi, and sometimes annex Areekee. The latter signifies Chief; and the former, Burying, or Sleeping-place, as well as we could understand."—*Captain Cook's Voyage to the South Pole.*

* *Lapidescent Juices.*—"Among the kinds of these liquors," says Mr. Boyle, in his Essay on Gems, "I have observed a sort that is of so fine a substance, and yet of so petrifying a virtue, that it will penetrate and petrify bodies of very different kinds; and yet scarce, if at all, visibly increase their bulk, or change their shape or colour. To which purpose, I remember, that I have seen divers animal and vegetable substances so petrified, as scarce at all to be taken notice of by their appearance, to have been altered by the operation of the

dug out of the earth subsequent to the flood, and supposed to have been modelled by the ancients,

petrescent liquor. I have with pleasure seen a thin cream-cheese turned into stone, when the size, shape, and colour even of the wrinkles, and the blueish mould, (which, it seems, it began to have when the liquor invaded it,) were so well preserved, that an hungry man would not have scrupled to have fallen upon it for a good bit. And, as for the hardness that this petrescent juice can give to the body that it penetrates, I shall now only remind you of what I lately told you: that I have had, (and I think yet have, in another place,) a pretty quantity of wood petrified in England, which retaining its former figure, and grain, and scarce at all visibly increased in bulk, was so very hard, that I could make impressions with it upon iron, and glass itself, and make it strike fire like an excellent flint. To which I shall here add, that the stony parts did not suffer the wood, which they had penetrated, to be reduced in the fire, either to ashes or charcoal. And I have by me a lump of mineral substances, wherein a petrescent liquor, that fills the large intervals between them, is transparent enough, and harder than most stones, as far as we could guess by some trial of it made by a skilful engraver of gems. And to these instances might be adduced many others, if it did not by these few sufficiently appear, that petrified agents may insinuate themselves into the pores of various bodies, and turn them into stone, without otherwise destroying their pristine nature, or so much as their former figure."

"An American mass of iron was discovered by some Indians in the district of Santiago del Estero in the midst of a wide extended plain. It projected about a foot above the ground, and almost the whole of its upper surface was visible; and the news of its being found in a country where there were no mountains, nor even the smallest stone within a circumference of 100 leagues, could not but be very surprising. Though the journey was attended with great danger, on account of the *want of water*, and abundance of wild beasts in these desarts, some private persons, in hopes of gain, undertook to visit this mass; and having accomplished their journey, sent a specimen of the metal to Lima and Madrid, where it was found to be very pure soft iron.

"As it was reported that this mass was only the extremity of an immense vein of the metal, a commission was given to Don Michael

are not monuments of art, but the real petrified animals themselves. This is why we find all these

Rubin de Celis to examine the spot, and the following is an abstract of his account.

"'The place is called *Otumba*, in lat. 27 28 8, and the mass was found almost buried in pure clay and ashes. Externally it had the appearance of very compact iron; but internally was full of cavities, as if the whole had been formerly in a liquid state. I was confirmed in this idea (says our author) by observing, on the surface of it, the impression of human feet and hands of a large size, as well as the feet of large birds, which are common in this country. Though these impressions seem very perfect, yet I am persuaded that they are either a *lusus naturæ*, or that impressions of this kind were previously upon the ground, and that the *liquid mass of iron* falling upon it received them. It resembled nothing so much as a mass of dough; which, having been stamped with impressions of hands and feet, and marked with a finger, had afterwards been converted into iron.

"'On digging round the mass, the under surface was found covered with a coat of scoriæ from four to six inches thick, undoubtedly occasioned by the moisture of the earth, because the upper surface was clean. No appearance of generation was observed in the earth below or round it to a great distance. About two leagues to the eastward is a brackish mineral spring, the only one to be met with in all the country. Here there was a very gentle ascent, of between four and six feet in height, running from north to south; all the rest being as perfect a level as can be imagined. The earth in every part about this spring, as well as near the mass, is very light, loose, and greatly resembling ashes, even in colour. The grass of the adjacent parts is very short, small, and extremely unpalatable to cattle; but that at a distance is long and extremely grateful to them: from all which circumstances it is probable that this mass was produced by a volcanic explosion. Its weight might be estimated at about 300 quintals. It is likewise an undoubted fact, that in these forests there exists a mass of pure iron in the shape of a tree with its branches.'"—*Ency. Brit.*

Geological Discovery in the United States.—"It may be interesting to antiquaries and the curious to be informed that two scientific gentlemen, viz., Mr. Chester, of England, and Mr. Davis, of Philadelphia, have recently discovered in a cave, on or near the Great Laurel Ridge of the Cumberland Mountains, three entire petrified bodies: one of a

hieroglyphical figures clustered together, apparently flying for protection to their homes.

> "A part how small of the terraqueous globe
> Is tenanted by man! the rest a waste,
> Rocks, deserts, frozen seas and burning sands,
> Wild haunts of monsters, poisons, stings, and death;
> Such is earth's melancholy map!"—*Young.*

Man, as he receded from the source of life,

dog lying flat upon the rock, and two of men, one sitting and the other standing, with a spear balanced in his hand. Preparations were making to forward their bodies to New York. The *Hamilton* (Tennessee) *Observer* remarks that among the many natural curiosities found in the extensive caves and grottos in the vicinity of the Great Laurel Ridge (Cumberland Mountains,) many human skeletons and bones of animals have been discovered, some of them in a petrified state. These caves abound in prodigious vaulted apartments and chambers, which, when viewed by torch-light, exhibit scenes of gloomy grandeur which astonish the beholder. Several petrified trees have also been discovered on the banks of the river near this ridge, as also bones of mammoths and other animals, whose races are now extinct. A private correspondent writes in his letter to a learned institution, that the wonderful discovery which will now shortly be presented to the public, is three petrified bodies entire, one of a dog, and two human bodies, one of them holding a spear. It is believed by the gentlemen who found them that all three bodies may be removed from their position in a perfect state, though the dog being in a lying posture upon a flat rock, it will undoubtedly be a difficult task to remove it uninjured. The human bodies appear to be those of men, probably hunters. Their clothing can hardly be distinguished, but still it is evident that that, too, was in a measure turned into stone. They are described thus:—One sitting, with the head leaning, as it were, against a projecting rock; and the other standing, with a spear balanced in his hand, as though he was surprised, and had just started in a quick walk. The dog lies as if crouched in terror, or about to make a spring; but the features or body are not distinct enough to determine which position. This wonderful formation cannot be accounted for in any other way than that these persons were buried by some terrible convulsion of nature. The cave in which

must not only have degenerated in colour, but in form and quality; losing his primitive whiteness, purity, and levity; becoming, by degrees, more and more estranged from the perfect laws of his Creator, diseased in body, and corrupt in mind, until he became finally solidified by the sudden gravitation attending the general catastrophe, and once more united to the elements from which he had been produced. The Scriptures inform us, that, prior to the final destruction of man, "God saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually. And it repented the Lord that he had made man upon the earth, and it grieved him at his heart. And the Lord said, I will destroy man whom I have created from the face of the earth; both man, and beast, and the creeping thing, and the fowls of the air; for it repenteth me that I have made them."—*Genesis*, vi. 5-7. "The earth also was corrupt before God, and the earth was filled with violence. And God looked upon the earth, and, behold, it was very corrupt; for *all flesh had corrupted his way upon the earth.* And God said unto Noah, the *end of all flesh is*

they were found is full 125 feet into the mountain, and is situated about a mile and a half beyond what is called Mammoth Grotto, in a direct line. The entrance to the place is difficult, and it is thought that it was never before attempted. At the foot of the entrance of the cave is a considerable brook of water, which appears to gather from all parts of it."—*Newspaper paragraph, April* 30, 1837.

come before me, for the earth is filled with violence, THROUGH THEM; and, behold, I will destroy them with the earth."—*Genesis,* vi. 13.

Let us enquire into the manner in which the deluge, or sudden overflow of the waters of our globe, was produced.

All exhalations from the body of the earth and seas, forming an atmosphere, have been, by our scientific men, considered to return to the earth again. No opinion, in my mind, can be more erroneous. Every living particle of matter, whether in the shape of a planet, vegetable, or an animal, creates its own atmosphere, and that atmosphere will increase with the increase (or enlargement) of the body that first produced it. Now the increase of that atmosphere cannot take place, if the matter exhaled from the planet, vegetable, or animal be again returned to it. We all, I believe, know that the living animal effluvia does not return to the body again. If, indeed, by neglect, it should be suffered to adhere to the surface of the body, disease must be the inevitable consequence. The same law holds good in the mineral and vegetable kingdoms. When our earth's atmosphere is clouded and condensed, neither animal nor vegetable can enjoy health. The chief cause of disease and death is the condensation of the atmosphere. All flame and vapour, or steam, rise upwards; nor can any force or pressure make the atmosphere of any

body gravitate or descend, until the elastic principle of that body be *changed*. This can never be accomplished but by electrical combustion. From the power of electricity, solids are converted into fluids, fluids into vapour or steam, and vapour or steam again into water: *thus* alone is matter allowed to return to its first element, the earth.* Mr. Whewell, speaking on this subject in the Bridgewater Treatises, says "the total quantity of air, of which our atmosphere is composed, is another of the arbitrary magnitudes of our terrestrial system. We can see no reason why the atmosphere might not have been larger in comparison to the globe which it surrounds; those of Mars and Jupiter appear to be so. But if the quantity of air were *increased*, the structure of organised beings would in many ways cease to be adapted to their place. The atmospheric pressure, for instance, would be increased, which, as we have already noticed, would require an alteration in the structure of vegetables." The atmosphere is always regulated by the body whence it proceeds, changes with its changes, and progresses with it. The altered structure of animals or vegetables would be the *cause* of the changes of their atmosphere, and not (as Mr. Whewell observes,) dependant upon them. As the human race degenerated, so did the atmosphere, proceeding from

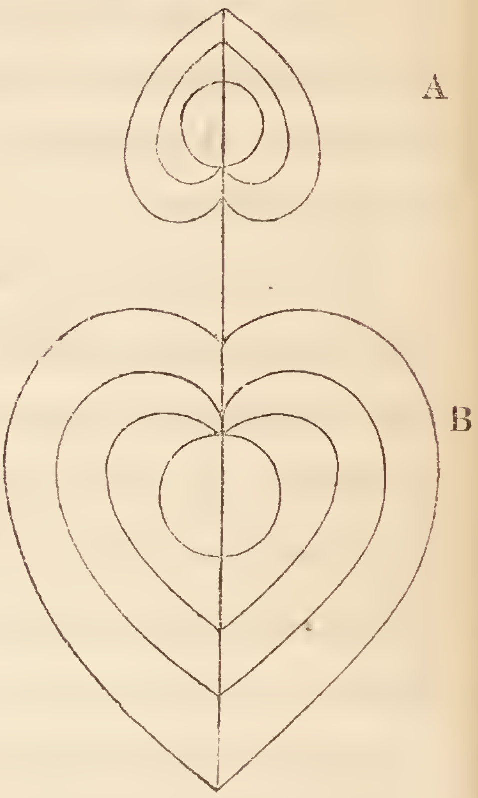
* Boyle says very justly that "even a metalline body, and therefore much more a vegetable or animal, may, by fire, be turned into *water*."

their own bodies, become progressively corrupt; thus an impediment was created to the daily descent of the celestial or solar matter: this matter only being allowed to reach the surface of the earth by the force of electrical combustion or pressure, the intervening atmosphere became clouded and compressed, disease, as I have before said, being the natural result both to body and mind. A progressive dissolution of the elements was the final consequence.

The original formation of the moon, or brain, by the ascent of matter to the point of extreme levity, has already been explained. After a certain quantity of these materials had been absorbed or accumulated into one condensed focus, any fresh deposition must have become repugnant to its nature. When, therefore, by the increased gravitation carried on upon the surface of the earth, a superabundant supply was conveyed by the apex to the interior or ascending current, oppression must have commenced in proportion to that superabundance at the extreme point of ascension—the brain or moon.* Thus the electric spark was elicited in the centre of that organ, a counter-current commencing for the first time by its rejecting or repelling back towards its own body the earth, downward layers of its own fluid materials: these layers becoming purified by the

* The moon bears the same analogy to the earth as the head to the human fœtus.

current from beneath, reascend to their point of levity or apex, converting the brain from the oval to the cordiform shape. At the point of levity, these materials, being united, are reorganized, and descend again through the centre of the brain, in a current or stream precisely opposed to the ascending one from the heart, (see diagram, in which A represents the moon, and B the earth.) From this moment compression on the heart must have commenced: a kind of medium being formed between the moon and earth by the opposing currents, electrical combustion ensued, and an exchange of materials was the result. The earth's matter escaping in the gaseous form to the moon, that of the moon descending to the earth in the fluid state.* Hence a gradual accumulation of this returned matter in the heart or centre of the earth, the quantity increasing with the increased organization of the brain above, and the ascending current from beneath, until it eventually became too powerful



* "In warm climates, the deposition of dewy moisture on animal substances hastens their putrefaction. As this is apt to happen only in clear nights, it was anciently supposed that bright moonshine favoured animal corruption."—*Dr. Ure.*

for restraint, when it burst forth from the womb of its parent, and became one living fluid ocean. This matter overflowing the sides of the earth, would gradually form a crystalline boundary or case, at a certain distance above the earth's surface: as this boundary increased in density, it would cause an added gravitation on the surface, by at first a partial, and eventually a total, exclusion of the solar rays. The continued force of pressure from the matter deposited by the sun, must have increased in proportion with the increase of the matter upon which it acted; the added gravitation of the matter worked upon by this external pressure, leavening the whole internal mass, and working its way upwards, would melt gradually the crystalline materials on the summit: eventually the whole of the upper portion of the earth would attain a perfectly boiling state: the outer ridge or case of ice, like the rim of bubbles on the surface of boiling water, would be set in motion and dissolved, gravitating, for the first time, in the form of rain, and thus boiling over the sides of the earth, would, by its inundation, occasion the devastation and destruction which really took place at the general deluge. The effect of this sudden gravitation towards the terrestrial apex or electric point, added to the process already described to have taken place at the magnetic or galvanic end of the line, with other circumstances, (see page 49 of this

work,) would occasion the sudden detachment of the whole mass of the earth from the bond which confined it to the sun, causing it to turn round by the weight of its own body, and to present its apex or lower extremity to that luminary.*

The earth, in every point of its orbit round the sun, still preserves its apex or North Pole, pointing to that luminary, and this is evidently the reason why the inhabitants of the North Pole have always six months' winter and six months' summer in their year. It is a remarkable proof of the wisdom and foresight of the Creator, that this, the coldest portion of our globe, should be always nearest to the sun, while the opposite extremity of the earth's axis, the South Pole, enabled by its own capacity to radiate heat, is the part placed farthest distant from his rays.

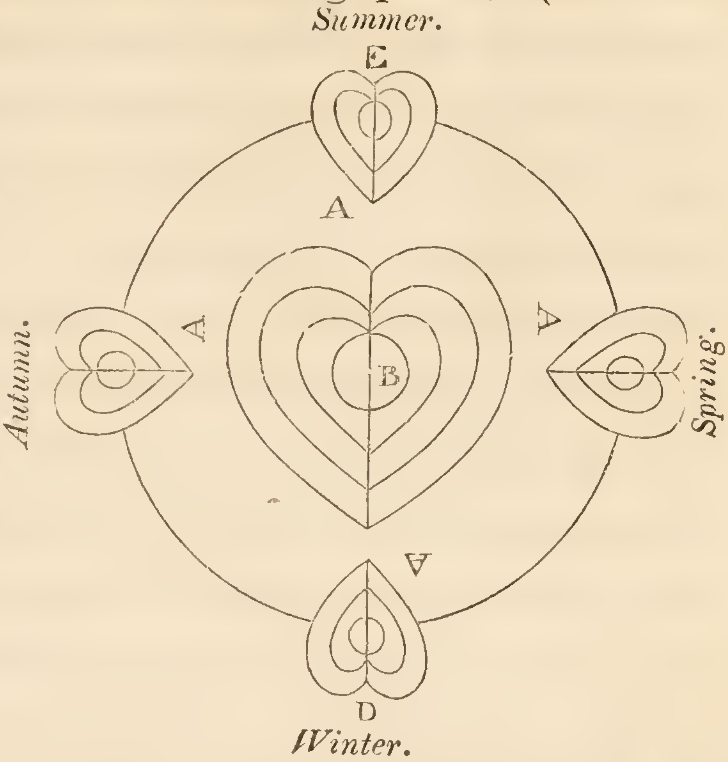
The planet having attained the perfection of its primary state of existence, having become quickened by external and internal pressure, revolved, for the first time, upon its axis and orbit,† still limited in its motion to a determined sphere, but

* Anaxagoras believed "that as soon as the world was made, and living creatures produced out of the world, the world *inclined of itself towards the south*, according to Divine Providence; that some part thereof might be habitable, others not habitable by reason of the *extremities of heat and cold*."—*Stanley's Lives.*

"It is computed that, had the earth received its motion from a single impulse, that impulse must have passed through a point about twenty-five miles from its centre."—*Mrs. Somerville.*

† "The action of a galvanic wire upon a magnet is not to attract

one grade higher in the scale of life. Commencing its course from the freezing point, (see the diagram, in which A is the earth, and B the sun,) the earth ascends at a prescribed distance from the sun, through the progressive degrees of heat in its orbit, until it attains the boiling point of



the universe E, and thence gradually descends by decreased temperature to the place, D, whence it first set out; having completed the first of a regular series of revolutions around the sun,* the heart or centre of the animal fœtus—our universe. All gradations of temperature, within the celestial

or repel it, but to turn it to the *right* and *left;* to produce motion not *to* or *from*, but *transverse* to the line drawn to the acting particles."
Whewell, B. Treatises.

" Mr. Adam Walker supposes the earth and planets to be turned on their axes by the impulse of light! He says that in all the positions in which the earth stands to the sun, during its annual revolution round him, it will be found that more rays fall on one side of its axle and centre, than on the other."

* " It is generally conjectured that the first object of idolatrous deification after the flood, was the sun; that every species of Pagan theology has originated from solar worship; and that the name of every deity and fabulous hero of the oriental world, as well as of those imported thence into Greece, is referable to the sun himself, or to some rite or ceremony appertaining to solar worship."—*Notes on Lucretius.*

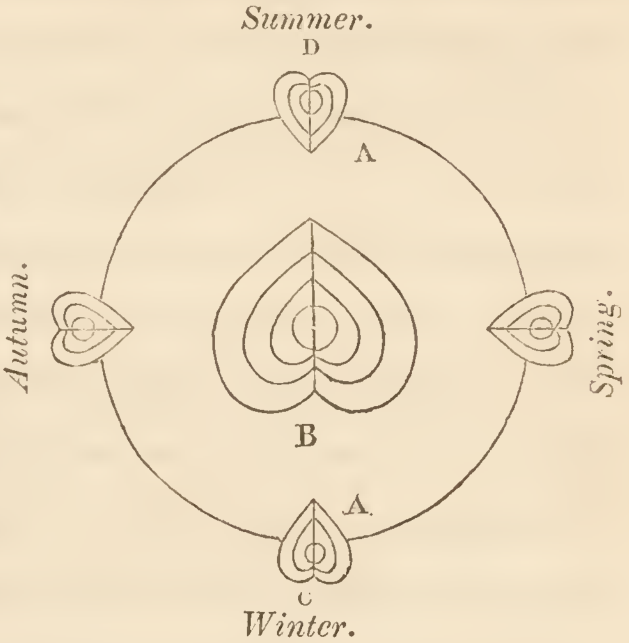
fœtus, being regulated by the sun, the earth, in its progressive revolution, experiences the four seasons of the year in succession: thus, on the retreat of its waters, after the deluge, the planet may be supposed to bud forth as it entered into the spring quarter,* to progress thence to the summer or universal harvest, to decline into autumn with the falling leaf, and finally to relapse into the severity of winter: like man, in this vegetable state of his existence, having a birth, a rise, decline, and fall; the end of one revolution being the commencement of a new and improved series of vital phenomena.

> "Look nature through, 'tis revolution all;
> All change, no death. Day follows night; and night
> The dying day; stars rise, and set, and rise;
> Earth takes th' example. See the summer gay,
> With her green chaplet, and ambrosial flow'rs,
> Droops into pallid autumn: winter grey,
> Horrid with frost, and turbulent with storm,
> Blows autumn and his golden fruits away;
> Then melts into the spring: soft spring, with breath
> Favonian, from warm chambers of the south,
> Recalls the first. All, to reflourish, fades;
> As in a wheel, all sinks, to re-ascend,
> Emblems of man, who passes, not expires."—*Young.*

The earth does not pursue alone the track I have

* "It is highly probable, indeed, that the Roman bards are right in their conjecture, that spring was the first season of the rising world. The superior fecundity of this quarter of the year justifies the belief, though no philosophic fact can be adduced to corroborate it. The commentators on the sacred writings are divided upon the question: for the civil and ecclesiastical year among the Hebrews began at different and indeed opposite periods; the former commencing at the autumnal equinox, as we learn from Exod. xxiii. 16, and xxxiv. 22;

described: the moon accompanies its course around the sun. Hitherto the brain had preserved, by its power, an equilibrium between the sun and earth, but the line of connexion being now severed, the moon would gravitate or turn round by its own weight, presenting its apex or electric point to the earth, and commencing from its original position (the boiling point, D,) a revolution around the heart of its own minute system, (see the diagram in which A represents the moon, and B the earth,) would pass at the appointed distance, in succession, through every degree of cold to the freezing point C, and then reascend, through the gradual increase of heat, to the boiling point A, whence it in the first instance gravitated. The moon, in its revolution around the earth, experiences the variations of the seasons on the minute scale, as that body does on the more extensive one, of the universe. It also causes the flux and reflux of the tides: when it is



and the latter at the vernal, as particularly commanded in Exod. xii. 2. At one of the equinoxes, however, it seems universally admitted that the earth first began to be inhabited; and most probably, as before observed, at the vernal."—*Mr. Good's Notes on Lucretius.*

It is natural to conclude that spring, which even now clothes the trees with their leaves, must have been the first season of the rising earth.

between the earth and sun it draws the earth's waters with redoubled force towards the apex of the earth, by adding to the electrical powers situated there: when in the opposite part of its orbit, it acts as a counter current, and draws them off in an opposite direction.

It is worthy of remark in this place, that the inferior and superior lives are carried on, as it were, in opposition to each other. The earth was formed at the freezing point of the universe, and moved from thence; it is the inferior machine: the moon, on the other hand, is the superior or celestial machine of the earth, and was formed in the first instance at the boiling point, from which it eventually moved. The earth radiates *upwards*, the moon *downwards*. This will be made fully evident when we treat further upon the third life of the perfect man.

> "By the warm sun
> Sustained, and cherish'd, earth renews her fruits,
> And man and beast survive."—*Lucretius.*

This newly acquired motion on its axis and orbit, by removing the earth from the continued winter, in which it had hitherto languished during the oval period of its existence, in a state of comparative darkness, sterility, and repose, must have produced an entirely new era in organization; every variety of colour, form, and quality being produced in turn on the earth's surface, by its exposure to the varied degrees of light and temperature in the fresh fuel

daily deposited by the sun, which, upon the earth, from its

> "Mantle's radiant hems
> Drops pearls, drops emeralds as she winds."

Plants and animals, becoming progressively more perfect and beautiful in structure, and each species being suitable to the local situation of the earth, in reference to the sun,* the external creation has at length acquired the magnificent and harmonized appearance which is offered to our contemplation in the present period.

Darkness, coldness, and death are inactive pro-

* "The length of the year is so determined as to be adapted to the constitution of most vegetables: or the construction of vegetables is so adjusted as to be suited to the length which the year really has; and unsuited to a duration longer or shorter by any considerable portion. The vegetable clock-work is so set as to go for a year."

"If we consider the time of putting forth leaves, the honey-suckle protrudes them in the month of January; the gooseberry, currant, and elder, in the end of February or beginning of March; the willow, elm, and lime-tree in April; the oak and ash, which are always the latest among trees, in the beginning or towards the middle of May. In the same manner the flowering has its regular time: the mezereon and snow-drop push forth their flowers in February; the primrose in the month of March; the cowslip in April; the great mass of plants in May and June; many in July, August, and September; some not till the month of October, as the meadow saffron; and some not till the approach and arrival of winter, as the lauristinas and arbutus. The fact which we have here to notice, is the recurrence of these stages in the development of plants, at intervals precisely, or very nearly of twelvemonths. Undoubtedly, this result is in part occasioned by the action of external stimulants upon the plant, especially heat, and by the recurrence of the intensity of such agents.

"The same kind of argument might be applied to the animal creation. The pairing, nesting, hatching, fledging and flight of birds,

perties of matter; light, heat, and motion belong to matter in its active or fœtal life. "All living bodies have a temperature peculiar to themselves, and independant of that of the atmosphere."* Thus the earth, when it entered upon its second state of existence, assumed the form of a heart, and its point of extreme heat being situated in the centre of the mass, where the materials are kept in a constant state of combustion, we find its general temperature corresponds with the degrees described in the subjoined map: receding from the centre, the materials, upon reaching the boiling point (or South Pole), gravitate thence by loss of heat over the whole surface, until they are eventually reunited in their most solid form at the North Pole, or terrestrial apex, and returned inwardly, by means of the line of gravitation, to the centre or heart again. The gradations of temperature are fully explained in the opposite diagram.

Our earth, in this its fœtal stage of existence, is

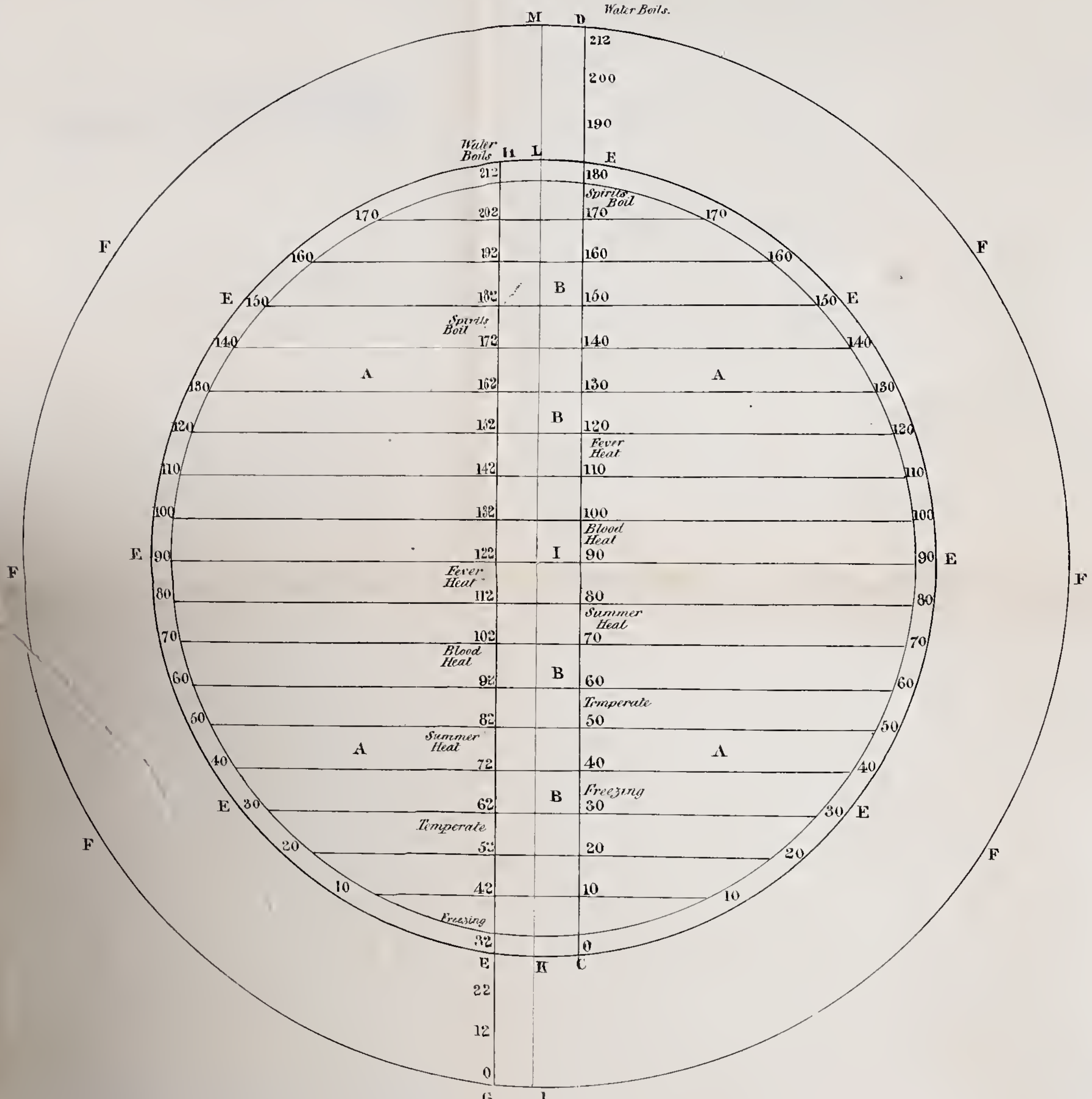
for instance, occupy each its peculiar time of the year; and, together with a proper period of rest, fill up the twelve months. The transformations of most insects have a similar reference to the seasons, their progress and duration. 'In every species (except man),' says a writer on animals, 'there is a particular period of the year, in which the reproductive system exercises its energies. And the season of love and the period of gestation are so arranged, that the young ones are produced at the time wherein the conditions of temperature are most suited to the commencement of life.'"

Whewell, Bridgewater Treatise.

* Richerand.

THERMOMETER OF LIFE.

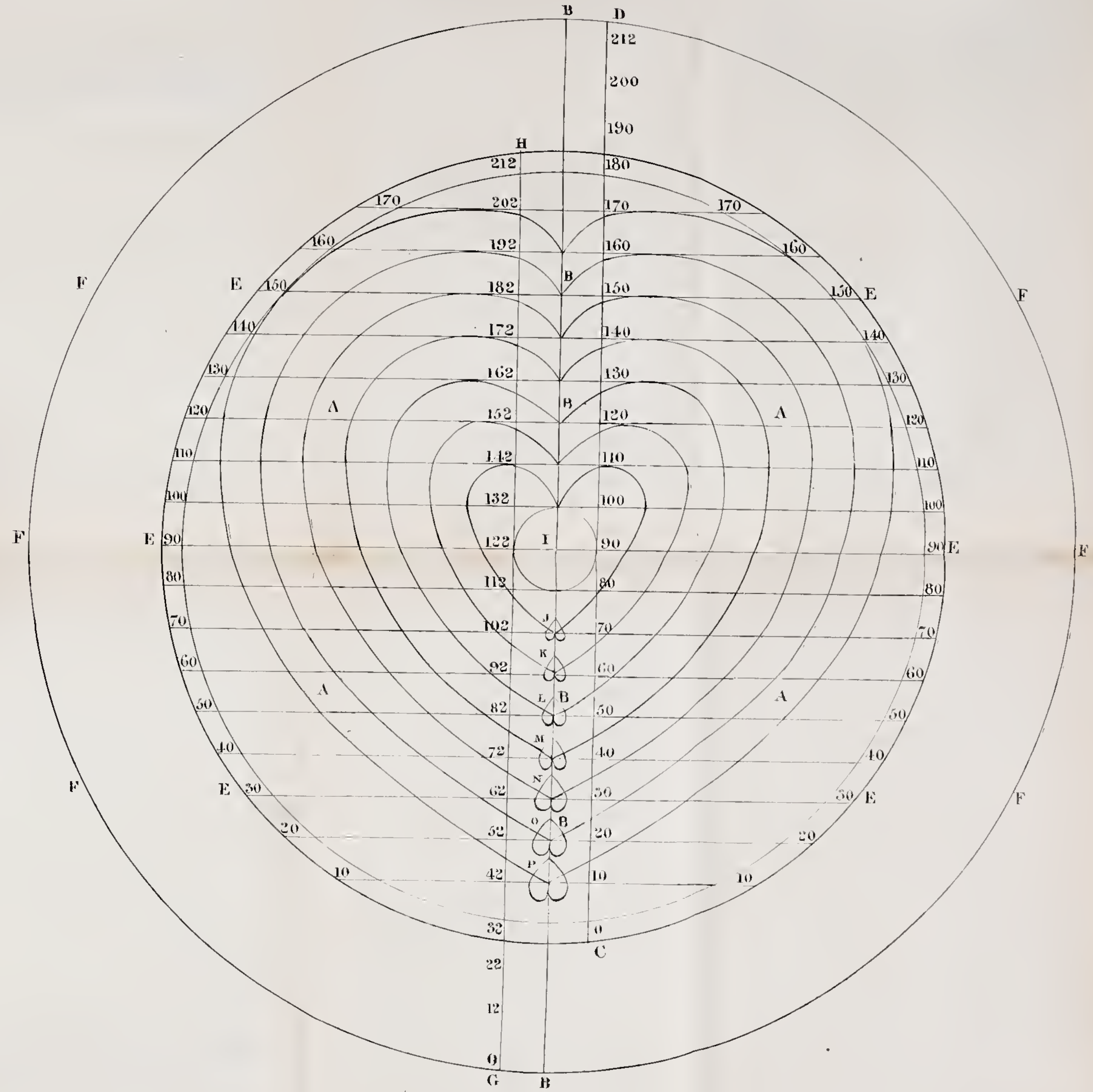
DIAGRAM 1.



A A A A. Represents the body of the Earth.
B B B B. The Line of Gravitation.
C. The North Pole, or freezing point.
D. The South Pole, or boiling point.
E E E E. The Earth's Surface, or *base* of its Atmosphere.
F F F F. The Extent or Boundary of the Earth's Atmosphere.

The figures from c to d, on the right hand of the line of gravitation (b), represent the current of matter ascending through the earth's body: the figures in the circle (e) express the gravitation of matter over the surface, forming its atmosphere (e) (f): the former show the increase of temperature in the body, the latter the decrease, or loss of heat. The 32° above the surface (e), in the ascent of matter, (from 180° to 212,) are represented in its descent, by an equivalent 32° below 0°, the point of extreme cold in the last sphere: organization always descending in proportion to its ascent, and gaining ground with each fresh movement. See the lines (L M) (J K). Thus, the next ascending motion of matter commences from 32° below the 0° of the line (c d), and progresses from g to h, [see the figures to the left of the line of gravitation (b)]: by this means, the temperature of the heart or centre of the earth (i), formerly 90°, becoming raised to 122°, that organ is compelled to throw off fresh matter to recover its equilibrium, when a repetition of the former process takes place, 32° being subtracted by a higher sphere, that of the moon, (see pages 266 and 527 of this work,) the same number added to the lower extremity of its own. The ascending current of matter, or line of gravitation, forms the medium of connexion between the Earth and Moon. [This Diagram, or Thermometer of Life, may be applied to all animal bodies, whether large or small: Diagram II. shows its application to the Universal Fœtus.]

DIAGRAM. 2.



A A A A. The Universe.
B B B B. The Line of Gravitation.
C. The North Pole, or freezing point.
D. The South Pole, or boiling point.
E E E E. The Surface of the Universe, or base of the Zodiac.
F F F F. Extent or Boundary of the Zodiac, or Universal Atmosphere.

The figures from (c) to (d) correspond with those in Diagram I., and mark the increase in temperature of the ascending current of matter: those in the circle (e) represent the decrease in temperature of the descending current, also seen in Diagram I. The 32° above and below the surface (e), and the line of figures (g) (h), correspond likewise with the former diagram. The sun (i), which is the point of extreme heat in the universe, does not appear to be such in the earth, Diagram I., because the cordiform lines have been there omitted. It will be seen in this diagram, that from the 00° or sun's centre (i), a separation of matter takes place, by means of gravitation to the lower part of the sphere (J): all further *ascending* degrees of heat are therefore foreign to the body, and belong to another and higher sphere; (in relation to our earth, this higher sphere is the moon.) The 90° or point (i) is alike the centre or point of extreme heat of the respective spheres of the planets Mercury, Venus, the Earth, Mars, Jupiter, Saturn, and the Georgium Sidus, (j, k, l, m, n, o, p,) all of which exist, on the more minute scale of organization, in the interior or body of our earth, (Diagram I.) [*To face page* 274.]

an epitome of the universe, being divided into three forms of matter; a solid centre or cavity, to be termed the heart or terrestrial sun,* which may be considered an elastic moving cave or swelling mountain, from the interior of which springs a boiling liquid element, or fountain of life, which filters down its sides, answering to the fluid medium in which the planets move around the sun: and, lastly, an aeriform boundary or skin, which consists of the particles thrown off from the mouth or cavity of the central heart; these three portions of matter, composing the fœtal earth are held together by the line of gravitation passing through the centre of its body.† This terrestrial line has the same

* "Many philosophers have believed that the central parts of the earth consist of a fluid mass of burning lava, which they have called a subterraneous sun; and have supposed, that it contributes to the production of metals and to the growth of vegetables."—*Dr. Darwin.*

"M. de Mairan has attempted to prove that the earth is infinitely more indebted for the heat it receives to its own central fires than to the rays of the sun. He allows that this latter, by adding some portion of heat to the surface of the earth, is the immediate cause of the vicissitude of the seasons; but asserts, that, were it not for the continual ascent of an immense quantity of subterranean heat, though the sun were perpetually to illuminate two-thirds of the globe at once, with a heat equal to that at the equator, the entire orb would soon condense into one general mass of *solid ice.*"

M. Good's Notes on Lucretius.

† "The diversity occasioned by the unequal attraction in metals, stones, &c. is much increased by what may be aptly termed the polarity of matter in that mode of arrangement which different substances assume in passing out of a fluid into a solid state. *For all bodies are capable of three states, solidity, fluidity, and a gaseous state.*

powers, in regard to the earth, as the celestial one, described in pages 30, 31, and 32 of this work, has on the larger scale of the universe. Its upper or southern end has the power of repulsion and galvanism, the lower or northern, that of attraction and electricity* at the former, the heart's materials are

The polarity of bodies arises from the manner in which the particles approach and lay by the side of each other, when the fire, that kept them separate, subsides, and the attraction of cohesion draws them into a solid."—*Lydiard, MS.*

* Of the Northern Magnetic Pole, Sir John Ross says, "It was scarcely censurable to regret that there was not a mountain to indicate a spot to which so much of interest must ever be attached; and I could even have pardoned any one among us who had been so romantic or absurd as to expect that the magnetic pole was an object as conspicuous and mysterious as the fabled mountain of Sindbad, that it even was a mountain of iron, or a magnet as large as Mont Blanc. But nature had here erected no monument to denote the spot which she had chosen as the centre of one of her great and dark powers; and, where we could do little ourselves towards this end, it was our business to submit, and to be content in noting by mathematical numbers and signs, as with things of far more importance in the terrestrial system, what we could but ill distinguish in any other manner.

"The place of the observatory was as near to the magnetic pole as the limited means which I possessed enabled me to determine. The amount of the dip, as indicated by my dipping needle, was 89° 59′, being thus within one minute of the vertical; while the proximity at least of this pole, if not its actual existence where we stood, was further confirmed by the action, or rather by the total inaction, of the several horizontal needles then in my possession. These were suspended in the most delicate manner possible, but there was not one which showed the slightest effort to move, from the position in which it was placed: a fact, which even the most moderately informed of readers must now know to be one which proves that the centre of attraction lies at a very small horizontal distance, if at any.

"As soon as I had satisfied my own mind on this subject, I made known to the party this gratifying result of all our joint labours; and

ejected in an elastic state of combustion; at the latter they are contracted and collected in the most solid and condensed form for the organization of the internal fabric.*

Any person must perceive, on examining our globe, that the mass of that portion approximating to the North Pole is chiefly land; while the greater part of the globe, (answering to the large and upper end of the heart) is comparatively one uniform mass of water and ice. It is a well known fact that very much heat is contained in ice, and if two pieces, as I formerly observed, be rubbed together, sufficient heat will be elicited to melt them. The elastic matter thrown upwards from the earth's centre, to the boiling point, (the South Pole, or

it was then, that, amidst mutual congratulations, we fixed the British flag on the spot, and took possession of the North Magnetic Pole and its adjoining territory, in the name of Great Britain and King William the Fourth. We had abundance of materials for building, in the fragments of lime-stone that covered the beach; and we therefore erected a cairn of some magnitude, under which we buried a canister, containing a record of the interesting fact, only regretting that we had not the means of constructing a pyramid of more importance, and of strength sufficient to withstand the assaults of time and of the Esquimaux. Had it been a pyramid as large as that of Cheops, I am not quite sure that it would have done more than satisfy our ambition, under the feelings of that exciting day. The latitude of this spot is 70° 5′ 17″, and its longitude 96° 46′ 45″ west."

Sir John Ross's Voyage to the North Polar Regions.

* "The earth, say the Joinus, (a sect of Hindoos,) is formed by nature; that is, by inherent properties existing in itself. * * * The world, in short, is produced as the spider produces his web, out of its own bowels."—*Ward's History, Literature, and Religion of the Hindoos.*

mouth of the heart, necessarily would freeze there, but the heat caused by its friction would preserve the mass above it, which is continually forced off, in a fluid state.* Thus water must always be

* "Water at 32° of Fahrenheit's thermometer is cold enough to become solid in the character of ice: a little heat and the pressure of the atmosphere make and keep it fluid, and we then call it water; but, if that heat be increased to 212° of the same thermometer, it will overcome the pressure of the atmosphere, and fly off as gas or steam."

"Vapour or steam rises from water at all temperatures, and even from ice."—*Whewell.*

In Captain Cook's second voyage, we learn that "after leaving Dusky Bay, they steered for Queen Charlotte's Sound, where they expected to find the Adventure. In this passage they met with nothing remarkable, or worthy of notice, till the afternoon of the 17th, when the sky became suddenly obscured by dark dense clouds, and seemed to forbode much wind. Presently after, six water-spouts were seen. Four rose and spent themselves between them and the land; the fifth was without them; the sixth first appeared at the distance of two or three miles from them. Its progressive motion was not in a straight, but in a crooked line, and passed within fifty yards of the stern without their feeling any of its effects. The diameter of the base of this spout was judged to be about fifty or sixty feet. From this, a tube or round body was formed, by which the water, or air, or both, was carried in a spiral stream up to the clouds. Some of the sailors said, they saw a bird in the one near them; which was whirled round like the fly of a jack, as it was carried upwards. From the ascending motion of the bird, and several other circumstances, it is very plain, that these spouts are caused by whirlwinds; and that the water in them was violently hurried upwards, and did not descend from the clouds, as is generally supposed. The first appearance of them is by the violent agitation and rising up of the water; and, presently after, you see a round column or tube forming from the clouds above, which apparently *descends* till it joins the agitated water below. Captain Cook says, apparently, because he believes it not to be so in reality, but that the tube is already formed from the agitated water below, and ascends, though at first it is either too small or too thin to be seen. When the tube is formed, or becomes visible, its apparent

flowing externally from the South Pole to the North or electric freezing Pole,* there by electricity to be worked again internally up the line of magnetism, and thence again to be thrown off as in the first instance.†

diameter *increases* until it is pretty large; after that, it decreases, and, at last, it breaks or becomes invisible towards the lower part. Soon after, the sea below resumes its natural state; and the tube is drawn, by little and little, up to the clouds, where it is dissipated."

* Sir John Ross described the temperature of the North Pole as being very variable, changing "from hot to cold even within a few hours."

† "Three-fifths of the surface of the globe are covered by the sea."
Bakewell.

"It is well known that the Euxine, the Mediterranean, and many other seas, flow perpetually in one uniform current, and exhibit no excess or deficiency from a flux or reflux of tide; of the two here enumerated, the direction of their currents is diametrically opposite; for, while the Mediterranean is for ever receiving an increase of water, and flowing towards the interior, the Euxine is perpetually parting with its waters and flowing externally into the Mediterranean. Yet each preserves its balance; the Euxine is never exhausted, nor the Mediterranean ever exundates. Different causes have been advanced in order to account for these extraordinary phenomena. With respect to the former, it has been generally supposed, that its supply is obtained from the Danube, the Don, the Nieper, and other considerable rivers that empty themselves into its basin; while the excess and superfluity of the latter is conceived to be carried off by evaporation from its surface. Neither of these explanations, however, are altogether adequate or satisfactory: it is more probable that the one is fed by springs, and the other emptied by fissures, which lie too low for the penetration of man, and form a communication with the Red Sea, whose current, contrariwise to that of the Mediterranean, is perpetually flowing out. Or perhaps the accumulation of water in the Mediterranean is carried off by an inferior and opposite current; for that such antagonist currents do occasionally, and probably at all times, exist in the ocean itself, there can be no doubt. Some very ingenious

The following is extracted from Captain Cook's voyage to the South Pole; I give it in his own words:

Sunday, January 30th. "On the 30th, at four o'clock in the morning, we perceived the clouds, over the horizon to the south, to be of an unusual snow-white brightness, which we knew denounced our approach to field-ice. Soon after, it was seen from the top-mast head; and at eight o'clock, we were close to its edge. It extended east and west, far beyond the reach of our sight. In the situation we were in, just the southern half of our horizon

experiments of Count Rumford seem, indeed, to demonstrate that fluids of all kinds, when heated to different temperatures in different parts of their volume, must necessarily have such an opposition of currents; the warmer, from its rarefaction and specific levity, occupying the superior part, and the colder the part below; a fact from which we may explain, to illustrate the remark by a common incident, the greater frigidity of the bottom of a boiling tea-kettle, though immediately in contact with the fire, when measured with the heat of its sides and summit. In like manner in the ocean, the philanthropic writer to whom I have just referred, suspects there is an under-current of cold water flowing perpetually from the poles towards the equator, even when the superior waters flow obviously from the equator towards the poles; nor is it possible, as he thinks, to account for the difference of temperature which exists at different depths of the sea upon any other principle. On the 23d of August, in the latitude of 69, when the temperature of the atmosphere, and probably of the surface of the sea, was 59½ of Fahrenheit's thermometer, Lord Mulgrave found that the water, at the depth of 4038 feet, sunk the thermometer to 32. And at the tropic, where the difference of seasons never produces a difference in the temperature of the atmosphere, more than five or six degrees, the variation between the heat of the water at the surface of the sea, and that at the depth of 3600 feet, has been found to amount to no less than 31 degrees: the superior temperature measuring 84, and that below not more than 43."

See Good's Lucretius, page 288. *Essays Political, &c. Vol. II.*

was illuminated, by the rays of light reflected from the ice, to a considerable height. Ninety-seven ice-hills were distinctly seen within the field, besides those on the outside; many of them very large, and looking like a ridge of mountains, rising one above another till they were lost in the clouds. The outer or northern edge of this immense field was composed of loose or broken ice close packed together; so that it was not possible for any thing to enter it. This was about a mile broad; within which was solid ice in one continued compact body. It was rather low and flat, (except the hills,) but seemed to increase in height, as you traced it to the south; in which direction it extended beyond our sight. Such mountains of ice as these were, I believe, never seen in the Greenland seas; at least, not that I ever heard or read of; so that we cannot draw a comparison between the ice here, and there. It must be allowed, that these prodigious ice mountains must add such additional weight to the ice-fields which enclose them, as cannot but make a great difference between the navigating this icy sea and that of Greenland.

"I will not say it was impossible any where to get farther to the south; but the attempting it would have been a dangerous and rash enterprise, and what, I believe, no man in my situation would have thought of. It was, indeed, my opinion, as well as the opinion of most on board, that this ice extended

quite to the pole, or perhaps joined to some land, to which it had been fixed from the earliest time; and that it is here, that is, to the south of this parallel,* where all the ice we find scattered up and down to the north, is first formed, and afterwards broken off by gales of wind, or other causes, and brought to the north by the *currents*, which we always found to set in that direction in the high latitudes. As we drew near this ice some penguins were heard, but none seen; and but few other birds or any thing that could induce us to think any land was near. And yet, I think, there must be some to the south, behind this ice; but if there is, it can afford no better retreat for birds, or any other animals, than the ice itself, with which it must be wholly covered. I, who had ambition not to only go farther than any one had been before, but as far as it was possible for man to go, was not sorry at meeting with this interruption; as it, in some measure, relieved us; at least, shortened the dangers and hardships inseparable from the navigation of the Southern Polar regions. Since, therefore, we could not proceed one inch farther to the south, no other reason need be assigned for my tacking, and standing back to the north; being at this time in the latitude 71° 10′ south, longitude 106° 54′ west."†

* About 70° 23′ south.

† "The risk run in exploring a coast, in these unknown and icy seas, is so very great, that no man, (the captain says,) will ever

Let us now turn from the narrative of the gallant and enterprising Captain Cook, to the picture given by our contemporary, Sir John Ross, of the opposite extreme of our planet, the North Pole.

"At present all was solid ice,* there was not a drop of water any where to be seen, nor was there the slightest mark to indicate the commencement of a thaw. Can it be believed that they were but

venture farther than he has done; and therefore the lands which may lie to the south will never be explored. Thick fogs, snow-storms, intense cold, and every other thing that can render navigation dangerous, must be encountered; and these difficulties are greatly heightened, by the inexpressibly horrid aspect of the country; a country, doomed by nature never once to feel the warmth of the sun's rays, but to lie buried in everlasting snow and ice. The ports which may be on the coast, are, in a manner, wholly filled up with frozen snow of vast thickness; but if any should be so far open as to invite a ship into it, she would run a risk of being fixed there for ever, or of coming out in an ice island."—*Mavor, Captain Cook's Voyage towards the South Pole.*

The captain, speaking of the snow and sleet, says that it "froze to the rigging as it fell, making the ropes like wires, and the sails like boards or plates of metal. The sheaves also were frozen so fast in the blocks, that it required our utmost efforts to get a top-sail down and up; the cold so intense as hardly to be endured; the whole sea, in a manner, covered with ice; a hard gale, and a thick fog."—*Captain Cook's Voyage towards the South Pole, lat.* 67° 20′, *long.* 137° 12′.

* "It must appear strange to readers ignorant of these countries, to hear that the people suffer more from thirst, when travelling, than from all the other inconveniences united. By us, at home, where the snow can never be very cold, where it can therefore be easily melted by the ordinary heat of the body, and where it can even be eaten as a substitute for water, the very different temperature of the same substance in that country is easily overlooked, as many persons are even ignorant of this fact. No great inconvenience can occur as to this matter, where its heat is rarely much below the freezing point, and

ten days to Midsummer; that all was still hard winter, and that winter in the middle, I may almost say, of summer; a season such as the January of our own native land seldom sees?"—"And to those who have not seen a northern ocean in winter—who have not seen it, I should say, in a winter's storm—the term ice, exciting but the recollection of what they only know at rest, in an inland lake or canal, conveys no ideas of what it is the fate of an arctic navigator to witness and to feel. But let them remember that *ice is stone;* a floating rock in the stream, a promontory or an island when aground, *not less solid than if it were a land of granite.* Then let them imagine, if they can, these mountains of crystal hurled through a narrow strait by a rapid tide; meeting, as mountains in motion would meet, with the noise of thunder, breaking from each other's precipices huge fragments, or rending each other asunder, till, losing

scarcely ever falls as low as twenty degrees. It is a very different thing, when perhaps the highest temperature of the snow, during the winter months, is at zero, and when it often falls to minus fifty or more, or to eighty degrees below the point at which we should attempt to thaw or to eat it in England. Were it not so bad a conductor as it is, we could, in this country, no more take it into the mouth, or hold it in the hands, than if it was so much red-hot iron; but from that cause, this consequence at least does not follow. The effect, nevertheless, which it does produce, is that of increasing, instead of removing, the thirst which it is endeavoured to quench; so that the natives prefer enduring the utmost extremity of this feeling, rather than attempt to remove it by the eating of snow."

Sir John Ross's Voyage.

their former equilibrium, they fall over headlong, lifting the sea around in breakers, and whirling it in eddies; while the flatter fields of ice, forced against these masses, or against the rocks, by the wind and the stream, rise out of the sea till they fall back on themselves, adding to the indescribable commotion and noise which attend these occurrences."

July 5, 1833. "An avalanche of ice from the cliffs, intermixed with rocks and water, was a novel sight, and, in this dearth of events, would have been interesting, even had it been far less splendid as a spectacle. Falling into the sea, it carried all before it; breaking the flat ice to a great distance, and showing us, had that been now necessary, the manner in which the icebergs are sometimes found to be covered with fragments of rock and layers of earth.

"So many of my countrymen have now seen the avalanches of the Alps, and so many more have read of those in prose and in poetry, as there are some who can never forget the splendid picture of Lowtherbourg on this subject, that any attempt on my part to describe such an occurrence as this must be superfluous, as it cannot fail to be feeble. Yet there was a variety in this, which, could I adequately describe it, in even the plainest prose, or represent it in the meanest drawing, would not fail to strike even those who have witnessed what Switzerland can show. It was not the snow-ball, gigantic as

that may be, detaching itself from the mountain summit, gaining in magnitude as in velocity during its progress, and then thundering down an irregular declivity, sliding, bounding, and breaking, till it had safely lodged itself in the valley below, or in the bed of a torrent; there perchance to obstruct a stream, be scattered over a plain, or if even overwhelming a cottage, to fall into repose among the ice that had received it. Here, all was as instantaneous as it was unexpected. The icy mountain that had towered over our heads so long, was gone before we could say, Behold, be aware: the instant of its motion was that of its descent, and before it seemed to have commenced that descent, it had plunged into the sea: no, not into a sea of water, but a sea of ice; breaking up those glassy fields which had so long bound us in, as if indeed they were but a feeble mirror; scattering their fragments far and wide, with a noise exceeding thunder, and prolonged even like the reverberations of the thunderbolt; until all settled again into the dead and icy stillness of its former repose; yet to leave that new mountain in the waves, a record of this catastrophe, as long as record could be of those mountains which the sun would ere long melt, and the winds float off to other and far distant regions."*

The earth is thus growing by the twofold means of deposition from the sun and internal combustion

* Sir John Ross's Voyage to the North Pole.

swelling its surface. By the first of these means it is creating immense rocks and strata of solid materials,* which are changing their form and qualities by repeated electricity in the interior of the earth: there waters collecting by the multiplied power of attraction, force new passages again and again into the sea. The sea increases and encroaches upon the land daily on some shores; whether it recedes in proportion upon other coasts may be doubtful.

The volcanic process which occasioned the deluge is still kept up in the two venous and arterial cavities of the heart. Into these two internal cavities the waters retreated after the flood, and hence we have the Atlantic and Pacific Oceans.

The matter in this heart, or cavity, constantly undergoing pressure, is ever kept in a boiling state of motion, vomiting forth the rising particles or scum from its mouth or boiling point, which, flowing over, gravitates down the sides of the machine, forming fresh depositions for the reproduction of new animal life. The illustration may be better

* "It has long been suspected by philosophers, that there is not at present so much water in the world as there was formerly; while the quantity of earth, and consequently of continents and islands, has been increasing in an inverse ratio; it has hence been conceived that *water has been continually converting into earth;* and some experiments have very considerably favoured such an hypothesis. There is no water so pure and uncompounded that it will not, if kept for three or four years, make an earthy deposit: rain water, distilled water, and snow, have all been tried for this purpose; but the same deposit, or

shown by a vessel of boiling jam. As this is made gradually to boil, it throws up a scum or refuse, which covers the surface, and between the solid jam and scum, or cover, is confined the steam: by contraction, the steam is increased, and particles or globules revolve round the sides of the vessel: with the additional pressure of the steam, the velocity is carried on with renewed force, until by varied revolutions, the whole mass presses on the central globule, and combustion takes place; the fluid particles are thrown in a direct line upwards,* forcing a part of the steam to rise and

transmutation into earth, has uniformly taken place. This phenomenon was long ago observed by Boerhaave, who declared, in consequence thereof, that there was no such thing as pure water to be obtained anywhere, or by any means. The seeds of plants likewise, as the white mustard seed, and some aquatic animals, as leeches, are known to increase in solid substance by the sustenance of water alone; or at least without the intermixture of earth, properly so called. Earth, then, is the production of water, and not an original element."

Mason Good.

"There are many reasons to believe, from the accounts of travellers and navigators, that the islands of ice in the higher northern latitudes, as well as the Glaciers on the Alps, continue perpetually to increase in bulk."—*Notes on the Botanic Garden, by Dr. Darwin.*

* "When pressure is taken off a fluid, it will fly off as steam."

Dr. Ritchie.

"In the memoirs of the French Royal Academy, 1703, is a paper of M. Amontons, in which, after observing that air may be compressed so as to be rendered heavier than gold, platina, or any other substance we are acquainted with: after conjecturing, moreover, that the body of the earth is composed of strata of substances of different gravities, progressively taking their stations according to their gradation of weight, he asserts, that the centre of the earth, containing a sphere of 6,451,538 fathoms diameter, is composed of air, thus compressed to a

flow over with the upper covering or scum;* this scum by trickling down the sides of the vessel, forming a case or exterior covering, and depositing at the bottom of the vessel all superfluous matter. The matter at the bottom of the vessel, after continuing to attract fresh matter to its surface, becomes oppressed, heated, and inflamed, so that the vessel above is constantly kept boiling, throwing off from its surface fresh formed scum, and with it a part of the steam which passes between the outward case and the vessel: so that we, in every situation and form of matter, have three distinct states, the solid, the fluid, and the aeriform.

"According to the conjectures of astronomers, the heat and light of the sun do not reside in its mass, but in a coating which lies on its surface. If such a coating were fixed there by the force of universal gravitation, how could we avoid having a similar coating on the surface of the earth, and of

density greater than that of any known substance besides; and from such elastic air, expanded by the heat of subterraneous fires, he deduces all the earthquakes that have ever agitated the globe."

Notes of Mason Good's Lucretius.

* "The following circumstance, communicated to me by a very intelligent glass manufacturer, evinces the difficulty with which heat passes through vitreous substances. When the pot containing the melted glass cracks in the furnace, it is common to pour out the contents into water. A mass of melted glass in this situation will soon become cool and solid on the outside; but the internal parts will preserve a red heat for four or five hours after, and may be seen shining through the water when the temperature of the outside of the glass is but sensibly warm."—*Bakewell.*

all the other globes of the system?" We have a similar coating on this earth, and every body, whether large or small, globular or otherwise, has a coat which serves the threefold purpose of protecting its own vitality and radiating light and colour to other bodies, while it forms the seed-bed for an entire new structure of animal creation. This coating is the skin of all animals. All the light of the sun, and of every planet belonging to him, is given off from the glazed surface or skin; but the heat resides internally in the cavity or heart.

It has been discovered by aeronauts, that in the upper regions of our atmosphere, snow is continually falling, and this even in the brightest and most serene weather. The snow which thus descends, when examined by them, was found to be, in many respects, totally different from that with which we are acquainted, its particles being of a far more solid, condensed, and crystalline nature.* That

* Mr. Hemming, President of the Marylebone Literary Institution, observed, that upon one occasion he accompanied Mr. Green, the aeronaut, in an expedition, when his attention was much aroused by the sight of a quantity of snow falling in every direction around the balloon. This snow was perfectly solid and shining in quality, and Mr. Hemming says, that the circumstance occurred on a day which was so sultry, and the air so dense and unobstructed by clouds, that a person who had not witnessed such a phenomenon, could scarcely have given credence to it.

"In the arctic regions, the existence of such particles of ice floating about in the atmosphere, is proved by the sense of touch, by their pricking the skin like needles, and raising blisters on the face and hands."—*Chambers.*

there is a region of perpetual snow encompassing our globe, we have a convincing proof in the immense mountain tops of various countries, which are ever covered with this pure material.*

* "The mountains which bound Asser on the north, are those of Anti-libanus, which with Libanus bound Cœlosyria. These mountains take the name of Libanus from their white tops; because, according to Tacitus, the highest of them are covered with snow all the summer; the Hebrew word Libanon (saith Weissenburg,) signifieth *whiteness.* * * * Niger out of Aphrodiscus affirmeth, that on Libanus, there falleth a kind of honey-dew, which is by the sun congealed into hard sugar, which the inhabitants call Sacchar, from whence came the Latin word Saccarum."

Sir W. Raleigh's History of the World.

"As touching crystal,' says Pliny, 'it proceedeth of a contrary cause, namely of cold; for a liquor it is congealed by extreme frost, in manner of ice; and for proof hereof, you shall find crystal in no place else but where the winter snow is frozen hard; so, as we may boldly say, it is very ice and nothing else, whereupon the Greeks have given it the right name crystallos, *ice.* We have this crystal likewise out of the east parts, but there is none better than that which India sendeth unto us. Engendered it is also in Asia, and namely about Alaband, Ortosia, and the mountains adjoining, but in request it is not no more than that which is found in Cyprus; howbeit, there is excellent crystal within Europe, and namely upon the crests of the Alps. King Iuba writeth, that in a certain island lying within the Red Sea over against Arabia, named Neron, there groweth crystal; as also in another thereby, which yieldeth the topaz precious stone; where, Pythagoras (lieutenant or governor under King Ptolemy,) digged forth a piece which carried a cubit in length. Cornelius Bocchus affirmeth, that in Portugal, upon certain exceeding high mountains, when they sink pits for the level of the water, there be found great crystal quarters or masses of a wonderful weight. But marvellous is that which Xenocrates the Ephesian reporteth, namely, that in Asia and Cyprus there be pieces of crystal turned up with the very plough, so ebb it lieth within the ground: an incredible thing, considering that, before that time, no man believed that ever it could be found in any place standing upon an earthy substance, but only among cliffs and craggs. It soundeth yet

Water is composed of hydrogen and oxygen. The sun throws off particles of its own pure material hydrogen, that is, diamond in its most elastic state, which matter, as it recedes thence to its place of destination, loses gradually its elasticity or fluid heat, and, as a necessary consequence, becomes collapsed or crystallized. The heat given off during the combustion of the particle is the pure hydrogen, and of this, the fluid medium, in which the heavenly bodies move, is composed. The remaining crystal is the same material in its coldest or most condensed form, which is pure iron or oxygen, and such is the snow which is perpetually falling round our earth; the freezing point being the point of contact, between solar and planetary matter.

The earth, on the contrary, is throwing off from a variety of sources its own materials, hydrogen, in an elastic form; which materials meeting the oxygen deposited by the sun, enter into combination with it in certain proportions, and thus we have water in all its modifications, and our atmospheric

more like a truth, which the same Xenocrates writeth, namely, that oftentimes it is carried down the stream running from the mountains. As for Sudines, he saith confidently, that crystal is not engendered but in places exposed only to the south; and verily this is most true, for you shall never meet with it in waterish countries lying northerly, be the climate never so cold, no though the rivers be frozen to an ice even to the verie bottom. We must conclude therefore of necessity, that certain celestial humours, to wit, of rain and some small snow together, doe concurre to the making of crystal."

air. Dew, hoarfrost, and rain, as well as water and ice, are all varieties of the same material, diamond, dependent alone upon the proportions in which the combination takes place. It will be recollected, that hydrogen is the lightest of all materials: oxygen is very much heavier than hydrogen. Thus the hydrogen rises from the earth expanding in proportion with its ascent; while, on the other hand, the oxygen falls to the surface of the planet. In this process, the opposing bodies are compelled to cut through each other. The hydrogen combines in certain proportions with the oxygen, to form water, rain, dew, and snow; and the rest escapes and ascends upwards.* The oxygen,

* Mr. Green, in an account of the fourth voyage and descent of the Vauxhall balloon, observed that, "the first layer of clouds was not more than 800 feet from the earth: these we soon passed through, and found another about 1,000 feet above us, and as we proceeded between the two, we were enabled at intervals to see the country through the open spaces in the lower one. Here the rain still fell in torrents, and although the balloon acted as a complete covering to the car, still the drops of water trickled down the silk from all sides, and meeting at the neck, formed a large stream of water, falling of course into the centre of the car, and passing through the basket-work. By altering the direction of this stream, we were able to keep the ladies in a great measure free from its effects, who were, however, so completely engaged in admiring the wonderful scene around them, that they appeared little to heed the above inconvenience, or our precautions to obviate it. We now passed through two more layers of clouds, the upper one being 3,500 feet above the level of the sea, as indicated by my barometer. It was from this layer that the wet was principally falling, for on arriving at its upper surface the rain had ceased. There was still, at a great altitude, a sheet of clouds sufficient to exclude the sun's rays. To this I attribute the conden-

although crystallized when deposited, contains a portion of latent heat: when united with the hydro-

sation of the vapours below, in the form of rain, for the rays of heat being reflected by it, none could have much influence on the lower parts of the atmosphere, whose moisture, instead of existing in a highly expanded form, becomes, in the partial absence of heat, and probably from a change in its electrical state, condensed into masses of vapour, the particles of which, by their mutual attraction, form drops of water. There are, doubtless, many unknown causes combining to produce these effects; but, from numerous observations, I believe the above statement to be nearly a correct one. My companions, the ladies especially, wished much to surmount the upper sheet of clouds, in order to witness the splendid effect produced by the light of the sun falling directly on it; but the great evaporation which must instantaneously have taken place from the whole machine, would have caused us to ascend rapidly to a very great altitude, and have prevented our reaching *terra firma* before dark.

"It is well known that atmospheric air is capable of dissolving, with a certain degree of heat, a given quantity of water. Dr. James Hutton ascertains the ratio of the dissolving power of air, in relation to water, in different degrees of heat; and shows that, by mixing a portion of transparent *humid warm* air with a portion of *cold* air, the mixture becomes *opake*, and part of the water will be precipitated; or, in other words, the vapour will be condensed into rain."—*Ency. Britannica.*

"There are some countries in which rain falls during particular periods of the year; there are others in which it has not the character of periodicity, though it may fall in greater abundance in one part of the year than in another. Mountainous countries are always more humid than level ones."—*Higgins's Earth.*

It is a singular circumstance that the heavy rains of India fall during the shifting of the monsoons. "There are some places in which rain is almost constantly falling. *A small rain falls every day in a zone on that side of the equator on which the sun is situated, and when it ceases at night it commences on the other side.* But there are also some places in which *rain seldom or never falls*, as in the great desert of Arabia, and on the shore of Peru, between the 15° and 30° of south latitude." This partial distribution of rain, like that of the

gen in the form of water, that heat becomes active, and locomotive animal life is generated; fluidity being the active principle* (see p. 173 of this work.) If the earth's temperature be moderate, this combination falls in the form of dew. If heat abound as

perpetual snow, depends entirely on the position of the earth, as regards the sun, and its own internal radiation of heat, or hydrogen.

"Sir John Leslie has shewn that, if all the aqueous vapour which can at any time be held in solution by the whole atmosphere were at once precipitated on the earth, in the form of rain, it would not be more than about five inches in depth: now, as in the course of a year, many times this quantity of rain falls from the atmosphere, its replenishment, of course, must depend upon evaporation; of which evaporation we may thus infer the general amount. With respect to the quantity of rain that descends annually on the entire surface of the earth, we want the means of forming an estimate, though there is no proof that this quantity is subject to any material difference. The distribution, indeed, as we have seen, diminishes with the latitude, and varies according to numerous local peculiarities, to some of which we shall heareafter allude. Often, also, no doubt for the wisest purposes, the same place is liable to considerable fluctuations in the annual amount of rain, or, at least, in the times of its precipitation; yet all these variations oscillate within *certain limits*, and scarcely affect the mean quantity proper to the place; thus shewing that the distribution of rain obeys the same laws that regulate the more general and fixed operations of nature."—*Dr. Prout.*

"In this country, Dr. Thomson has estimated that, taking the whole of Great Britain together, the mean fall of rain amounts in the course of a year to thirty-six inches, the dew being included, (which is considered to amount to about four inches,) and that the quantity of water evaporated is about thirty-two inches."—*Ibid.*

* "We have Mr. Green's authority for stating, that the noise produced by rain leaving a cloud resembles the buzzing of an immense swarm of flies and bees. This is the first part of the process of aerial distillation; and on nearing the earth, when the finer particles mix and form globules; the sound emitted resembles a shower of peas, or small stones suddenly rattled on the extensive surface of the balloon."—*Dumfries Courier.*

in the summer season, we have violent rains, thunder-storms, &c.* or if, on the contrary, the earth be in the coldest wintry point in the heavens, and its mass is proportionably condensed, the snow from without falls unimpeded to the surface.

Dr. Prout observes, "that it is a remarkable fact, that whenever electrical phenomena are more than ordinarily vehement, they are always accompanied by some unusual appearance of *cold.* Thus the alarming descents of hail formerly noticed, which occur most generally in temperate climates, have, in nearly every instance, been attendants of violent thunder-storms.† Snow also is almost always

* "Mr. Graham, the aeronaut, describes one of his trips as being very grand from the extraordinary appearance of the clouds and the flashes of vivid lightning which were visible considerably beneath him. Whilst up Mr. Graham was compelled to bale the water out of the car, owing to the torrents of rain that fell. He describes the cold as very intense when up at the utmost altitude, which was more than three miles."

† Dr.Prout remarks, that it "seldom hails in *winter*, and hail‡ *during the night* is very uncommon. There are on record many instances of these calamitous visitations, which are usually accompanied by whirl-

‡ Heyne, in his Traits on India, states, that "hail falls only in the hottest season, in April and May. It is usually in pieces of the weight of half an ounce; but sometimes of very considerable magnitude. It is accompanied by heavy thunder, and storms or gusts of wind from the eastward. Showers of hail are more frequent above the Ghants than below them. The natives call the hail *rainstones*, and ascribe to it great invigorating virtues."

"Masses of immense size are said to have fallen from the clouds at different periods: in the latter part of Tippoo Sultan's reign, it is on record, and well authenticated, that a piece fell near Seringapatam

highly electric.* These, and many other circumstances, connected with the great and sudden production of cold in the higher regions of the atmos-

winds, and by the most appalling electrical phenomena. During storms of such degree of severity, hail-stones have sometimes fallen of enormous magnitude, and often of an irregular shape, as if they were the fragments of a thick sheet of ice suddenly broken: a supposition, which alone will explain the formation of angular masses, many inches in size, and many pounds in weight. The production in the middle of summer of the intense cold that is thus indicated, is a puzzle which philosophers have been unable to solve."

It must be evident, upon reference to the situation which the planets occupy in relation to the sun in the summer time, that, being opposite the full stream of matter issuing from the mouth or cavity of the universal heart, they must encounter a much more abundant supply of this matter, which diverging, would form the sheets of ice above alluded to: and I should add that they are also passing at that period through the region of positive electricity. It is therefore easy to account for masses of iron falling from the heavens, elsewhere stated to be of exotic origin. The condensation of large masses of pure oxygen would occasion these phenomena.

* "Snow-storms sometimes present a luminous appearance. This singular phenomenon has been frequently observed, and we have one very remarkable instance on record. It was witnessed in the year 1813, by a party of gentlemen on Loch Awe, in Argyleshire, and it not only gave to the surrounding scenery the appearance of an immense sheet of fire, but illuminated the persons of the individuals who composed the party."—*Higgins's Earth.*

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of the size of an elephant, which, by the Sultan's officers, was reported to produce 'the effect of fire on the skin of those who touched it:' a comparison naturally made by persons ignorant of the sensation of extreme frigidity. It is stated that two days elapsed before it was entirely dissolved, during which time it exhaled such a stench as to prevent people from approaching it; fear probably occasioned the latter report. That this account is in the public records of Tippoo's reign, I have from a gentleman of the greatest respectability of character, and high in the civil service of the Honourable Company."

Heyne.

phere, during the display of electrical agency, cannot, in the *present state of our knowledge,* be explained. For example, whence, in the middle of summer, arises that instantaneous development of extreme cold, which occasionally produces the terrific hailstorms above alluded to? At present the answer does not appear. With respect to the sources of the electricity of the atmosphere, there have been many opinions. It seems now to be admitted that electrical excitement does not arise from the mere evaporation and condensation of water; but that in order to produce such excitement, there *must always be some chemical combination or separation.* Thus electrical excitement is the result of the chemical changes which often accompany the evaporation of water. During combustion also, there is an ample evolution of electricity; the burning body giving out negative, the oxygen positive electricity. In like manner the carbonic acid sent forth, during vegetation, is charged with negative electricity, and at the same time the oxygen, as is most likely, is charged with positive electricity."

Snow, I repeat, is the purest form in which the sun's matter reaches our earth, and I consider that snow (such snow as falls on the higher portions of our globe, in a crystallized state, is identical with pure oxygen, and that this is the most perfect condition in which we can obtain the diamond;

the degrees beneath that point of deposition being indeed gradations lower in the scale of life, but alloyed by terrestrial substances. The deposition of the crystallized oxygen must take place at some terrestrial point or degree corresponding with the 40° Fahrenheit, below which water invariably expands in freezing: (prior to that period contraction is carried on.) It is the meeting between the pure oxygen and the opposing ascending hydrogen, which occasions this expansion. The sun's oxygen begins to expand at a certain number of degrees above our freezing point, and from that time, combines with terrestrial matter.* Mr. Whewell in the Bridgewater Treatises, makes the following observations: "There is a peculiar circumstance still to be noticed in the changes from ice to water, and from water to steam. These changes take place at a

* The following extract is from Mr. Monck Mason's account of the late aeronautical expedition, from London to Wielburg, and it seems to corroborate our view. It was about half-past three in the morning, when the balloon having gained a sudden accession of power, owing to a discharge of ballast, which had taken place a few minutes before, while navigating too near the earth to be considered perfectly safe in a country with the main features of which we were totally unacquainted, began to rise with considerable rapidity, and ere we had taken the customary means to check the ascent, had already attained an elevation of upwards of 12,000 feet. At this moment, while all around is impenetrable darkness and stillness, and darkness most profound, an unusual explosion issues from the machine above, followed instantaneously by a violent rustling of the silk, and all the signs which may be supposed to accompany the bursting of the balloon, in a region where nothing but itself exists to give occasion to such awful and unnatural disturbance. In the same instant, the car, as if suddenly

particular and invariable degree of heat; yet they do not take place suddenly when we increase the heat to this degree. This is a very curious arrangement. The temperature *makes a stand,* as it were, at the point *where thaw, and where boiling take place.* It is necessary to employ a considerable quantity of heat to produce these effects; *all which heat disappears, or becomes latent, as it is called. We cannot raise* the temperature of a thawing mass of ice till we have thawed the *whole.* We cannot raise the temperature of boiling water, or of steam rising from it, till we have converted all the water into steam. *Any heat that we apply while these changes are going on is absorbed in producing the changes.*"

Dr. Prout, in speaking of the limits of perpetual snow, says, "These limits, of course, may be naturally supposed to follow the mean temperature of 32° from the level of the sea, in the Polar regions, to the highest point of their range under the equator. This inference is obvious, and, gene-

detached from its hold, becomes subjected to a violent concussion, and appears at once to be in the act of sinking with all its contents, into the dark abyss below. A second and a third explosion follows in quick succession, accompanied by a recurrence of the same astounding effects; leaving not a doubt upon the mind of the unconscious voyager of the fate which nothing now appears capable of averting. In a moment, after all is tranquil and secure, the balloon has recovered her usual form and stillness, and nothing appears to designate the unnatural agitation to which she has been so lately and unaccountably subjected."

rally speaking, correct; though it is liable to certain modifications, and to some anomalies, of which the following are the most remarkable. Under the equator the limits of perpetual snow are the most fixed and steady, and seem to exist generally at an altitude of between 15,000 and 16,000 feet. As we recede from the equator, the oscillations for the most part become more striking, and all the phenomena assume a more irregular form. Such, for example, is the case in the Mexican Cordilleras; but still more evidently in the Himala range, where there is a difference of no less than 4000 feet between the limits of perpetual snow on the northern and on the southern sides of the mountain, that on the northern being the highest. As we proceed towards the temperate zones, we find, in mountainous countries, *below* the limits of perpetual snow, immense bodies of ice, or *glaciers*, as they are termed. These glaciers are formed by the alternate *melting and congealing* of the extensive beds of snow that lie above them. The glaciers, accumulating in valleys, are often, by the *enormous and increasing weight of the snow and ice* in the upper parts, pressed downwards far beyond the limits of the snow itself. Such are the *glaciers* of Switzerland, of Norway, and of other countries in temperate climates. All these circumstances, with others that might be mentioned, and many probably that are unknown to us, combine to render the limits of perpetual snow

irregular. These irregularities are so great, that Humboldt has given as a mean of many observations, that at the *equator* the limits of perpetual snow are nearly 3° *above the freezing point*, while in the temperate zone they are nearly 5° below that point, and in the frigid zone, no less than 10° or 11 below freezing; which observations seem to prove that the general temperature of the air decreases in the equatorial, otherwise than in the colder regions.* From the peculiar distribution of the land in the southern hemisphere, little is known of the line of perpetual snow in that part of the world; but it will probably be found to be different from that in the north, and generally *lower*." According to

* "A foot of snow is not a great depth of water, at least till it is frozen into a mass, nor is it an easy matter to measure the depth to which a fall of snow is equivalent; such is the drifting, and, still more, the difficulty of securing any thing like an average within the compass of any gauge that has yet been devised. Had it been otherwise, we should have been as pleased as we were desirous, after a whole year's residence, to know the actual fall of water in this country and climate. As far as I have read, no such estimates have been attempted respecting these northern regions and lands of snow. But if, under a vague estimate from mere recollections or observations of weather, we had considered this a country in which much water fell in the course of the year, we might not be very wrong. The past registry, which is but the usual noting of weather, gives many days of snow or rain. Future observers, if future observers should ever have such opportunities, must try to determine what the fact is; but whatever that may prove, the rain that falls here is of little use, since it has no duty to perform for vegetation; and if the snow protects any thing, it is a soil without plants to derive benefit, or rocks which are alike indifferent to rain or drought, heat or cold."—*Sir John Ross's Voyage to the North Pole.*

Mrs. Somerville, the cold is greater in the southern than in the northern hemisphere. This must obviously be the case from the different position of these poles with regard to the sun; the south pole or heart-shaped end being always averted from that luminary, while the northern or apex is presented towards it. The following extract is from Mrs. Somerville's account of the limits of perpetual snow. "In Sandwich Island, between the 54th and 58th degrees of latitude, perpetual snow and ice extend to the sea beach; and in the Island of St. George's, in the 53d degree of south latitude, which corresponds with the latitude of the central counties of England, perpetual snow descends even to the level of the ocean. It has been shown that this excess of cold in the southern hemisphere cannot be attributed to the winter being longer than ours by 7¾ days." The earth's heat all radiates from the south pole, and there gradually condensing as it is thrown off, the whole appears a continuous mass of ice, snow, and water, there being little impediment to the pure oxygen, deposited from the sun, which, from the earth's situation as regards that luminary, must be of a more crystalline nature than elsewhere on our planet.

All the organization of this fœtal earth has proceeded from its heart or sun, (the centre of its body.)* Its materials, originating from one simple

* "The conjecture of M. le Marquis de Laplace, that the materials

element, the diamond, have derived from combustion every variety, colour, form, and quality.*

The rocks considered primary, secondary, and tertiary, by geologists, are but the scum or refuse of the more pure materials contained within the earth: they are a coating formed by the matter continually gravitating from the upper to the lower extremity of the fœtal body. These materials are thrown off originally in a gaseous form, but, losing their heat, become condensed around the surface of the machine. The talented M. Cuvier has enumerated the species of which this crust or skin principally consists; I subjoin it, as important to our subject.

"Flint, clay, lime, magnesia, and oxyde of iron, comprise *nineteen* parts in *twenty* of the external part of our planet.

"From these five substances, united in *different proportions*, almost all rocks and stones are formed. In this department of nature, as in every other with

which constitute this globe were originally in an elastic form, and then, in cooling, assumed a liquid consistency, and finally became solid, is greatly strengthened by the late experiments of M. Mitcherlich, who composed and crystallized, by the heat of intense furnaces, many of the mineralogical species which enter into the composition of primitive mountains."—*Cuvier.*

* "All nature abounds with charcoal, or its combinations; whole mountains, nay kingdoms, are composed of chalk and limestone, in which diamonds ought to be contained in astonishing abundance. But, plentiful as this principle may be, there appears at present no likely method of obtaining it pure or uninsulated."

The Doctor, Magazine.

which we have any acquaintance, an endless variety of important changes are effected by the simplest means.

"These five substances may probably be reduced to still simpler elements, as it is now ascertained that the *earths* are metals united with oxygen; and it is also probable that the *metals* have all *one common base.*

"The other solid substances most abundant in the mineral kingdom are carbon and sulphur."

Whatever figure or form matter may now present to our view, it has all proceeded from diamond. In speaking of the primary rocks, Bakewell says, "They are extremely hard, and the substances of which they are composed are crystallized. They form the lowest part of the earth's surface with which we are acquainted; and they not only constitute the foundation on which the other rocks rest, but in many situations they pierce through the incumbent rocks and strata, and form also the highest mountains in alpine districts. That primary rocks environ the whole globe will not admit of direct proof; but, from their frequent occurrence in mountainous districts in the most distant parts of the world that have been examined, we may infer that some of the rocks of this class constitute the foundation rock of every country."

The animals which existed prior to the general deluge, were inhabitants of the solid surface of the

ovum itself: they were, in fact, a parasitical race of beings, by whose united efforts the internal fabric of that ovum was progressively disunited and decomposed, until eventually the dissolution of its elements brought on that catastrophe, which involved all alike in one common fate, Noah and his family alone excepted, who were preserved to perpetuate the race upon the earth. The extreme pressure produced around the whole earth, at that period, causing a sudden change to take place in the individual atmosphere of every living inhabitant, each part like the whole mass became enveloped in a crystalline or glassy case,* and thus returning to its primary state of solidification, the atmosphere imprisoned its living tenant in a solid and apparently indestructible tomb.† Hence all the varieties

* "In Lipari, one of the volcanic isles, the mountain de la Castagna, according to Spalanzani, is wholly composed of volcanic glass, which appears to have flowed in successive currents, like streams of water falling with a rapid descent and suddenly frozen.* * * Numerous veins of obsidian (or volcanic glass) are said to intersect the cone of Mount Vesuvius, and serve as a *cement*, to keep together the loose materials of which it is composed."—*Bakewell.*

"Where the obsidian appears in a state of *perfect glass*, it is very near to where it has been first ejected from the side of the crater, and in a situation where it must have undergone a rapid cooling."—*Ib.*

† Boyle, in his Essay on Gems, mentions the finding diamonds "enclosed in loose stones and even in rocks; of which we have credible testimony: which seems," he observes, "not more strange to me than a stone, which I have by me, which being a kind of pebble, contains in it a perfectly shaped serpent, coiled up, but without a head, which appears to have been formed before the stone, in regard that in the upper and lower parts of the solid stone, there are cavities left, which

of fossil animals and plants, some of which have been preserved, even down to these our own times,

together make up one cavity, just of the size and shape of the contained body; to which, as it was easy for the matter of the stone, while 'twas yet a soft body, to accommodate itself exactly, so 'tis scarce conceivable how, if the pebble had been first formed, the inclosed animal, if it were one, or the matter whereof the seeming animal afterwards was formed, should not only get in, but find a cavity so curiously shaped, and so fitted to its bulk. And that this variety was produced at several times, might be further argued from this, that the seeming serpent is plainly of another and clearer kind of stone than that of the mould that encompasses it; and of the mould itself, one part, contiguous to the included body, is whitish, and abounds in shining grains or flakes, in both which it differs from the other and far greater part."—"I have now by me a fine piece of clear and solid amber, (presented me by a person, no less extraordinary than it,) in which is included a large entire fly, in shape and size much like a grasshopper, but variously and curiously coloured, with his wings displayed."

"As Thomas Winter, of Soulby, near Kirby Stephen, was on the 8th inst. building a stable for the Rev. John Collinson, he had occasion to break a blue whin-stone, and in the centre he discovered a small cavity, in which was a living spider and several young ones. It has been examined by several ladies and gentlemen in the neighbourhood, who have all signed a declaration expressing their belief in Thomas Winter's statement. The stone and spider are now in the possession of the Rev. J. Collinson, who, we understand, has taken them with him to his house at Kibblesworth, in the county of Durham."—*Kendal Mercury, August* 1, 1834.

Imitative freaks of nature.—"In New Hampshire, United States, there is a range of fine hills, which receive the general designation of the White Mountain. One of them, about a thousand feet high, situated near the road from Franconia to Plymouth, is called the Profile Mountain, in consequence of a remarkable appearance which it bears when viewed in a particular direction. On one side, the mountain rises by a gentle wooded ascent; on the other, it presents a precipice, descending at an angle of about eighty degrees, or nearly perpendicular. The upper half of this precipice, composed of brown granite, forms the outline of a human countenance, consisting of a

with small traces of decay. This solidification being caused by a sudden gravitation or pressure

low hanging brow, a deep-set eye, a low nose, and a prominent mouth, thus bearing a resemblance to the Ethiopian variety of the species. The chin is well defined, and seems to rest on a large bank of debris, forming the lower half of the mountain. The part composing the profile has the appearance of long exposure to the weather, and it is inconceivable that it has at any time been affected by the hand of art.

"A similar phenomenon exists within the bounds of the city of Edinburgh. On the summit of the Calton Hill, immediately beneath a naval monument to Nelson, is a rocky precipice of probably a hundred feet in height, extending between the base of the building and a walk below. The *face* of this precipice, as it may literally be called, when viewed from a point to the south of Holyrood Palace, about half a mile distant, presents a profile of considerable elegance, and in every way well proportioned. What is stranger still, this profile bears no fanciful resemblance to that of the hero of Trafalgar.

"Landscape marble is a well known kind, which, on being cut into thin slices, and polished, gives the appearance of a picture, containing fields, rivers, hedge-rows, trees, and, in some instances, a back ground of distant eminences. In some precious stones, miniatures of natural objects, such as trees, shrubs, mosses, and even animals, are frequently found. According to D'Israeli, in his Curiosities of Literature, such curiosities were well known to the ancients.* Pliny mentions an agate in which appeared, formed by the hand of nature, Apollo amidst the nine muses holding a harp. Majolus assures us, that at Venice another is seen, in which is naturally formed the perfect figure of a man. At Pisa, in the church of St. John, there is a similar natural production, which represents an old hermit in a desert, seated by the side of a stream, and who holds in his hand a small bell, as St. Anthony is commonly painted. In the temple of St. Sophia, at Constantinople, there was formerly, on a white marble, the image of St. John the Baptist, covered with the skin of a camel, with this only imperfection, that nature had given him but one leg. At Ravenna, in the church of St. Vital, a cordelier is seen on a dusky stone. They found in

* Pyrrhus possessed an agate, on which was represented the shapes of sundry things; as beasts, rivers, forests, and birds, formed by the hand of nature.—*Petrarch's View of Human Life.*

from without, completely filled up all the interstices of the body or plant with that material which nature had sought to reject from its surface or skin. That the atmosphere at the period of the deluge was of a more dense nature than that now surrounding our earth, I have already endeavoured to prove,* for the material must have varied with the body from which it was produced.†

Professor Faraday, in a lecture delivered at the Royal Institution, in 1836, on the subject of silicified trees and plants, began by explaining the nature of silica, a chief ingredient in the composition of all

Italy a marble, in which a crucifix was so elaborately finished, that there appeared the nails, the drops of dlood, and the wounds, as perfectly as the most excellent painter could have formed them. At Sneilberg, in Germany, they found in a mine, a certain rough metal, on which was seen the figure of a man, who carried a child on his back. In Provence they found, in a mine, a quantity of natural figures of birds, trees, rats, and serpents; and in some places of the western parts of Tartary, are seen, on divers rocks, the figures of camels, horses, and sheep. There is also preserved in the British Museum, a black stone, on which nature has sketched a resemblance of the portrait of Chaucer."—*Chamber's Edinburgh Journal.*

* "We have no evidence that the sea at present can incrust these shells with a paste as solid as marble, sand stone, and even the compact limestone, in which we see the shells of our layers imbedded."—*Cuvier.*

† *Fossil Trees in Edinburgh.*—In the sandstone quarry now working at the west end of Rutland street, several fossil trees of considerable magnitude have been found in the course of the operations. These have mostly been broken down by the workmen, as the substance of the trees seems formed of materials not very different from the sandstone in which they are imbedded; but specimens in plenty are still lying about, of large size.—*Edinburgh Advertizer, April* 10, 1833.

See also p. 257-261 of this work.

stones and earths, of which flint and sand are almost entirely composed,* observing that every kind of glass is produced by the combination of silica with an alkali, and that the difference in the quality is owing to the proportion of the elements not being the same, or to the nature of the alkali, or the presence of other substances."† After producing some very remarkable specimens of silicified trees

* "Silex, or the earth of flints is the most abundant, particularly in the primary mountains: it exists nearly pure in rock-crystal and the mineral quartz. Stones or rocks, of which silex forms the predominant part are extremely hard, and strike fire with steel: such rocks are denominated siliceous."—*Cuvier.*

"Silex is a most important production, and in its hardness, insalubrity, and other refractory properties, we recognise a substance admirably adopted for the purpose to which it has evidently been designed, viz. that of constituting the stamina or groundwork, as it were of our globe, and which could not be withdrawn without subverting the whole: silex is found in small quantities both in plants and in animals, but does not, like hydrogen, oxygen, carbon, and azote, form a constituent element of organized beings."

Dr. Prout. Bridgewater Treatises.

"Silica is now called an acid."—*Mr. Brande.*

† "The lecturer then proceeded to exhibit a variety of the crystallized forms of silica, and to explain their several characters. He produced several magnificent specimens of agates, amethysts, chalcedonis, &c. He also directed the attention of his hearers to several specimens of wood, which had been completely silicified, and still their several characters were completely preserved. Some of them had been found in the sandy deserts of Egypt, and some extremely fine specimens had been brought from Van Diemen's Land. One of the most striking examples was the section of a fossil palm tree, the exterior of which so nearly resembled a tree in its original state, that, to a casual observer, the change that it had undergone would not be distinguished; this he compared with a corresponding section of a palm-tree from the collection of Mr. Brown, the distinguished botanist. He observed that not

and plants, Dr. Faraday continued as follows, "it is plain, on reviewing some of the cases above

only the external character of the silicified tree had been preserved, but the internal arrangement was not in the least degree destroyed, for all the vessels preserved their original forms, and these were more beautiful and distinct in this specimen than in any that could be procured by the section of a living tree. Indeed, so much was this the case, that it might almost be said that the internal structure of a tree which had been turned into flint, could be examined with greater attention and nicety than in any other way. It often happened that the ossification was not complete, and thus the interior became silicified, while the exterior decayed; or that the interior perished, while the exterior was preserved in a fossil form. At other times the internal fibrous part decayed, and the leaves and seeds were preserved in this shape. In a great variety of cases which were exhibited, the whole form and structure was changed, and all the parts of the tree were filled up, and the whole vegetable fibre became a solid mass of flint, while none of the organs appeared to be destroyed. This change could not be effected by any modern process.

"It would be impossible by any mechanical means with which he was acquainted to fill up all the parts of a piece of wood with water or spirits of wine, without destroying infinitely more of the internal vessels by the process than was done in the case of the silicified trees and plants. Even those plants most light and yielding in their texture were preserved in as fine a manner as if living. The change was very remarkable in the endogenous class of plants, such as the palms, which increased by a continued addition of fibre cells or vessels from the centre, where of course the fibres were extremely close together, but all of which had been filled with silica: it was still more so, however, in the exogenous plants, which increased by external layers, many of which were most irregular, but the change had been as complete as in other cases. He then referred to a specimen of a silicified oak tree, in which the form and colour of all the vessels, together with the various knots, had been preserved, but still the whole was a mass of flint. Some specimens of silicified trees had recently been brought from the Isle of Antigua, which had been changed while in a state of decay. This decay had suddenly been stopped, and a complete alteration had taken place in the character of the substance. So well was the appearance of these plants preserved,

described, that a process different from the tedious one of infiltration and gradual deposition must have produced the appearances in question. Neither the free disposition nor the forms of the delicate vegetable structures could have remained unaltered. The loss of colour must have followed the death of the plant, and the total loss of its figure would have

that a botanist could at once determine their character. Sometimes the change was so complete, that it could not be perceived by mere visual observation. At the present time many things were found in the vicinity of the Geysers, or boiling fountains in Iceland, which were completely incrusted with silica. In point of fact the *water of the Geysers was only an alkaline solution of silica, produced by heat;* this was also the probable cause of their violent action. The plants, however, thus acted upon, were by no means completely silicified, nor did they continue in a permanent form. There was no evidence that the process of silicification was going on now. It had, however, been stated that the waters of some rivers possessed this power, and such was said to be the case with respect to the Danube, near the ruins of the bridge of Trajan, and also in Lough Neagh, in Ireland. There were some recent cases which had been referred to as a proof that the waters of Lough Neagh possessed this quality. Mr. Faraday then exhibited a specimen of what was alleged to be silicified wood from this lake, and which belonged to Mr. Brown; he stated that it could not be said to have undergone this change to the extent that appeared in other instances, as parts of it appeared to be *carbonified*, and would burn when exposed to a strong flame. There was no doubt, however, that a part of it had been acted upon by the silica, and that the *bark* had apparently become fossil. Mr. Lyall states that he had met with some specimens of the seeds of plants now alive, which had been silicified. To this extent only did the evidence go that the process was going on at present. Any satisfactory theory on this subject must not only account for the change in trees and plants, but also for the formation of agate, amethyst, and amorphous quartz. He was satisfied that it could not be produced by heat. Indeed it appeared to him that there was no satisfactory evidence that silica could be crystalized by heat."—*Newspaper Paragraph.*

resulted from the gradual changes which it must needs have undergone during the continuation of a process so tedious. The remains are, in fact (if I may use such an expression), embalmed alive. To produce this effect, we can only conceive a solution of silex in water so dense as to support the weight of the substance involved—a solution capable of solidifying in a short space of time, or capable at least of suddenly gelatinizing previously to the ultimate change by which it became solidified into stone. I need not point out the extreme importance of this supposition—I had almost said of this fact—to any general theory of the earth."

The decay of one race of animals always erects the basis of a new species of living machinery; we shall find that the destruction of the primitive races of animals, has produced a garden, or resting-place for their successors: and that from the decomposed fabric of the antediluvian world have arisen the mineral, vegetable, and animal kingdoms in all that variegated splendor now exhibited on the surface of our planet.*

* "We have very fairly ascertained the uniform march and regular succession of the primitive formations, but the study of secondary formations has scarcely yet commenced; that wonderful series of unknown Zoophytes, and marine mollusca, followed by reptiles and fresh-water fish equally unknown, and these in their turn replaced by zoophytes and mollusca, more akin to those of the present day; those land animals and mollusca, and other fresh-water animals, also unknown, which next occupy the places, to be again displaced, but by mollusca and other animals similar to those of our own seas; the relations of

The primary condition of all matter being the solid or oval, the second the fluid or fœtal, the third

these various beings with the plants, whose remains accompany theirs: the relations of these two kingdoms with the minera layers which contain them; the more or less their uniformity with one another in different basins; all these are a series of phenomena which appears to me to call imperiously for the profound attention of philosophers."

Cuvier.

"The coppery state is supported by a red sandstone of the period when those famous layers of coal were deposited, the resource whence the present generation is supplied, and the remains of the earliest vegetable productions which ornamented the face of the globe. We find, from the trunks of ferns, whose impressions they have preserved, how much these ancient forests differed from the present.

"We next arrive at those transitive formations in which primæval nature, a native *inanimate* and *solely mineral, seemed still to contend for empire* with animated nature. Black limestone, and slates which only present crustacea and shells of species now extinct, are presented alternately with the remains of primitive formations, and announce to us the fact of our having reached the most ancient formations that it has been permitted to us to discover; those ancient foundations of the actual coating of the globe, the marble and primitive slates, the gneises, and finally the granites."—*Ib.*

Extraneous fossils. "From them we have learned, that the strata, or at least those which contain their remains, have been quietly deposited in a fluid; that the variations of the several strata must have corresponded with the variations in the nature of the fluid; that they have been left bare by the transportation of this fluid to some other place; and that this fact must have happened more than once. Nothing of all this could have been known with certainty without the aid of extraneous fossils."—*Ib.*

"Thus it is undeniable, that the masses which now form our highest mountains, were originally in a state of liquefaction; for a long time they were covered by waters which did not then nourish living bodies; it was not only after the appearance of vitality that important changes took place in the nature of the deposited matter; the masses before have changed as well as those subsequently produced."—*Ib.*

"The argillaceous ores of iron comprehend the ochres, and more

the aeriform or locomotive, I shall assume that, after the flood, the crust of this earth became re-organized in that succession, and treat the subject accordingly.* Every rock has had for its base, or

particularly those mentioned by Fourcroy under the name of *bog-ores* of iron, which are commonly met with disposed in beds, and seemingly deposited by waters. Mr. Fourcroy informs us, that this kind of ore is very often in the form of spherical bodies either regular or irregular. Organic matters, such as wood, leaves, bark, shells, &c. are not unfrequently found in the state of bog-ores. *This kind of transition seems to indicate an analogy between iron and organic substances.* In the wood of Boulogne, near Auteuil, there is a mine of bog-ore of iron, in which vegetable substances become mineralized almost immediately under our eyes."—*Ency. Britannica.*

"The production of iron from the decomposition of vegetable bodies is perpetually presented to our view; the waters oozing from all morasses are chalybeate, and deposit their ochre, or being exposed to the air, the iron acquiring a calciform state from its union with oxygen or vital air. When thin morasses lie on beds of gravel, the latter are generally stained by the filtration of some of the chalybeate water through them. This formation of iron from vegetable recrements is further evinced by the fern leaves and other parts of vegetables, so frequently found in the centre of the knobs or nodules of some iron ores.

"In some of these nodules, there is a nucleus of whiter iron-earth, surrounded by many concentric strata of darker and lighter iron earth alternately. In one, which now lies before me, the nucleus is a prism of a triangular form with blunted angles, and about half an inch high, and an inch and a half broad; on every side of this are concentric strata of similar iron-earth alternately browner and less brown, each stratum is about a tenth of an inch in thickness, and there are ten of them in number. To what known cause can this exactly regular distribution of so many earthy strata of different colours surrounding the nucleus be ascribed? I don't know that any mineralogists have attempted an explanation of this wonderful phenomenon. I suspect it is owing to the polarity of the central nucleus."—*Dr. Darwin.*

* "Dr. Robert Brown has shown, by a most unexceptionable series of experiments, that locomotion, even when apparently independent

foundation-stone, one solid seed or ovum, originally thrown off from the centre of this earth in an aeriforme or elastic state, and subsequently by loss of heat become collapsed or crystallized. The late celebrated researches of Professor Ehrenberg have

of external forces, may and does exist among particles that are absolutely lifeless; nay, which have never been alive; so that, should not this phenomenon admit some more probable solution, it would seem that the long established definition, which declares matter to be inert, may perhaps require a serious modification. This apparently independent motion of the molecules of matter may appear to some to be a close approximation to the vital motions of plants, or the spontaneous movements of animals; and, indeed, the idea would seem more feasible than the belief of some German philosophers, that crystallization is an effect of vitality. The facts are simply these: that grains of pollen, particles of dead plants, some of which have been in herbaria for upwards of a century, nay, even fragments of powdered glass and stone, when diffused through water, and viewed with a good microscope, are seen to be in a constant state of motion; and this, independent of any evaporation of, or currents in, the fluid; nay, still to maintain their restless activity when hermetically sealed between two plates of glass, so as to exclude, as far as possible, all external agitation, and are found, even under such circumstances, to continue their motions unremittingly during an indefinite period; nay, even after the lapse of months, (I believe we may now say years,) to be as full of motion as when first observed."—*Professor Burnett.*

"Supposing the ground to have been once moistened with a lapidescent liquor, whether brought thither by springs, or any other way; one may in our hypothesis well enough account for this difficult phenomenon, that now and then, not only in the surface of the ground, and perhaps upon rocks themselves there are found aggregates of figured stones, that seem to grow upwards, as it were from the root; which much puzzle men to know how they came there, and may incline them to their opinion, who ascribe vegetations to stones. But to this may be answered, that many of the concretions, we are speaking of, may have been formed in wombs that lay, though not deep, yet under ground, or in shallow cavities in the surface of it, and that,

proved that rocks are composed of an aggregate of minute infusoria in a fossil state, and they also afford strong reason for the supposition that the base of these organic bodies is Iron.* It is my belief that of these infusoria all rocks are composed

after their formation, the looser earth that surrounded them, may have been washed off by rains, blown off by winds, or otherwise removed, leaving behind them these stones that adhered firmly to a solid body. Besides if I had time, I think it were very possible for me to shew, that strong concretions might be produced by the mechanical action of the air upon the stony particles that successively apply themselves to the matter, that first begins to coagulate, when they are ready to be forsaken by the moisture that accompanied those particles, and was necessary to their due application to the casual rudiments (which pass for roots) in imitation whereof I have more than once obtained both from saline and stony solutions, dry tufts of prettily figured, and diaphonous or white, but very slender, *striæ*, (if I may so call them,) that seemed to grow out of the solid glass, and made men wonder how they came thither, no water or other liquor appearing near them."—*Boyle's Essay on Gems.*

* "I had been inclined," says Professor Ehrenberg, "even before these researches, to assign a great influence in the origin of the Raseneisen (bog-iron-ore) to an infusorium discovered by me in 1834, and of which I have, in April 1835, given an engraving in plate X. of my Codex of Infusoria, under the name of *Gaillonella ferruginea*, which is perhaps the same as the *Hygrocrocis ochracea* of botanists. The minuteness of these corpuscles deterred me, however, from publishing this important circumstance; but since the discovery of so many and various shield-infusoria as stone masses, and since I have found that even the animalculæ, which almost entirely form the Polirschiefer (polishing slate) of Bilin, are also a species of the genus Gaillonella, I no longer hesitate to add this observation to the rest. That the formation of the Raseneisen, or of the Weisenerz (meadow-earth), as a continual phenomenon, excites great attention; and has given rise to many, but not sufficiently explanatory theories, is well known. I have every spring observed in the marshes, particularly in the turf districts about Berlin, large quantities of a substance of a very deep ochre yellow, sometimes passing into flesh red,

—in the crystalline state apparently, but not the less to be classed among the tribes of living beings

often covering, to a great extent, the bottom of the ditches from one to several feet deep. and much developed in small holes, and in the footsteps of animals grazing. This mass is extremely delicate, and without any consistency, dividing itself at the least touch into an indefinite number of parts. Where it has become dry, after the evaporation of the water, it appears exactly like oxide of iron, for which it has been formerly often mistaken. We perceive, however, under the microscope, with a moderately high magnifying power, extremely slender articulated threads, the members of which measure only $\frac{1}{1000}$ of a line, and in which the yellow colour is inherent. At the beginning of last summer I satisfied myself that these slender articulated threads do not lose their form in a strong red heat; but the colour changes to a red-brown, which is exactly that of iron-ochre. It was that by the application of muriatic acid the colour was dissolved, without the articulated threads being changed; in the solution precipitated iron was clearly visible. There is, also, one of the genus Gaillonella, very similar to the Bacillaria, but a very minute organic being, containing a yellow ochre colour, in which there is probably a great proportion of iron, in the same manner as phosphate of lime is contained in the bones. By extraction of the lime, the gelantine of the bones retains, as is well known, its form: in the same manner the *Gaillonella ferruginea* possesses a siliceous shield, which retains its form unchanged after the extraction of the iron.

"I have already examined with the microscope various specimens of the Raseneisen from Berlin, from the Ural, from New York, and other places, and find the extremely voluminous yellow iron-oxide which is attached to them, and *which, perhaps, has originally served to form them,* to consist also of similar connected threads in rows, which resemble the Gaillonella in size, form, and colour, and which are not destroyed by the action of heat, or muriatic acid, but no longer form such evident articulated threads as in the living animal. If I compare it, when its fibres are disjointed, with the *Gaillonella distans* in the Polirschiefer, I find no reason to consider the phenomenon in the Wiesenerz-ochre as a different one. I received, through the kindness of Mr. Karsten, the vegetable products of the mineral water of the Salt-works of Colberg, in which there is a yellow earthy substance, in great quantity, formed on the surface. At first it collects at the

belonging to the surface of the earth. That animal life may be developed from crystals by the agency

surface of the stagnant water, as I was informed, in a greenish mass, similar, therefore, to the protoxide of iron. Dried and exposed to the air, it remains of a beautiful ochre-yellow, and on being heated it becomes of a red-brown blood-stone colour. On dissolving it in muriatic acid I found a great quantity of iron, with remains of silex. This substance consists, like the marsh-ochre, of articulated threads, which separate into single members: it resembles, also, very much the *Gaillonella ferruginea.* These Gaillonellæ are used in Colberg for iron-colour in house-painting. The circumstance that this production of the salt-spring collects on the surface of a yellowish-green colour, and afterwards sinks to the bottom and changes into yellow, determines, perhaps, a special, and not otherwise characterized species of the same genus.* Thus the siliceous contents of the Raseneisen, and the *incombustible organic* form of the minute bodies constituting the ochre which surrounds it, make it highly probable that here, also, *an organic relation exists through infusorial formation,* though only so far as to form *after death, by the large proportion of iron they contain, a central point or nucleus,* to which all other iron in solution immediately around it is attracted."

In the words of Dr. Darwin:

"The obedient steel with living instinct moves,
And veers for ever to the pole it loves."

"The infusoria rock of Bilin forms the upper layer (fourteen feet deep) of the Tripleberg, which (differing from the Kritschelberg, with which it was formerly confounded) is elevated about 300 feet above the level of the brook Biela. It lies on a bed of clay, which is superincumbent to the chalk-marl. Beneath these gneiss is found, as the base of all the minerals of that district. The upper masses of stone lie west of the Tripleberg, on a projected mass of basalt, which forms

* "Another quantity of this mass sent from the Durrenberg Salt-works has determined this question, since it appears in this, that these living animals (?) also are always yellow; that in dying they rise to the surface of a grayish-green colour (protoxide of iron), and in sinking to the bottom they again take the yellow colour."—*Professor Ehrenberg on Fossil Infusoria.*

of galvanic action, has been testified by our celebrated contemporary, Mr. Andrew Crosse; and his

the Spitalberg, and on the other side of which (west) Grobkalk, with many discernible petrifactions of small chalk sea animals (many Crinoideæ) lie on the gneiss. The former masses (Saugschiefer and semi-opal) lie in the Polirschiefer towards the exterior upper part, the earthy below, disposed often without order in layers, the inferior ones being almost horizontal.

"The particular attention paid to the Saugschiefer and semi-opal, whose numerous transitions were exposed to view, has now given the scarcely unexpected result, that these, also, are in the closest connection with the infusoria. The Saugschiefer is, upon microscopic observation, plainly only a Polirschiefer, whose infusoria shells are cemented by, and filled with a formless siliceous matter, just as there are fossil shells, both filled and empty: this produces its greater specific weight, and all its other characters. In the gradual transitions to the semi-opal we see how the cement has increased at the expense of the infusoria shells, while the small shells have decreased in quantity and in sharpness of outline.

"The formation of the semi-opal in the Polirschiefer appears to be this, that it lies imbedded in it in nodules, in the most minute transitions from the Saugschiefer. A close microscopical analysis of the most varying semi-opals from Bilin, and the neighbouring valley of Luschitz, has shown that all these stone nodules, which sometimes equal flint in hardness, and give sparks, consist partly of infusorial forms held together by a small quantity of transparent siliceous cement, and partly contain, enclosed within them, single infusoria, but of a larger size, just as amber contains insects. It is often very plainly to be seen, that the disposition of the Polirschiefer has not otherwise been altered, either by its change into Saugschiefer (cemented and permeated by amorphous siliceous matter), or by its change into semi-opal, than that by some means a part of the infusoria shells, particularly the more delicate ones, have been eaten away or dissolved, with which another part, especially of the larger forms, has been covered in an unaltered state. In this process the stratified structure remains as fully visible in the Polirschiefer as it had before been, and forms the stripes of the semi-opal. The white, and less transparent stripes, are mostly well preserved layers of infusoria. It is not improbable that a dissolving medium may have acted upon the siliceous

experiments prove that the change of these minute organic beings, from a latent to an active

shells, as drops of water or steam act on meal. The parts in contact with it were gradually penetrated, and partly dissolved and changed into opal; or the penetrating matter producing the opal, and which occupies but a small space, has assimilated to itself a greater or less part of the empty siliceous shells. The true wood-opal, in which the woody substance is changed into opal, renders the opinion probable, that a peculiar opaline mass has supplanted the decayed and dissolved parts of the woody substance, retaining however its form. We cannot easily imagine the expulsion of the siliceous shield-mass by the opal-mass, and of the latter filling its space; therefore it appears conceivable, that the opal may be probably formed from the infusoria shells, simply by water, or any other dissolving medium except fluoric acid, just as dough is formed of meal. Unkneaded dough contains stripes of meal,—semi-opal has often stripes of infusoria: both are hydrates.

"In the semi-opal of Bilin, and of the valley of Luschitz, were visible, enclosed like insects in amber, 1, *Gaillonella distans;* 2, *Gaillonella varians*, particularly the larger individuals; 3, *Gaillonella ferruginea;* 4, siliceous needles of sponges. The first is mostly dissolved, at times preserved as principal mass, with the outline rather rounded off, although the connecting medium has quite a glassy appearance. The second is mostly well preserved, but rather rounded off; the third is sometimes well preserved in the buff-coloured specimens, but on account of its minuteness does not admit of a determining character. The latter, however, is not unimportant with regard to the question of the action of volcanic agency: it may, perhaps, have been deposited in the moist parts of the previously formed Polirschiefer. Upon heating this yellow semi-opal, it became red, and acted as iron. The red was the articulated fibres of the Gaillonella: they could not, therefore, possibly have been heated in the air. The tranquil horizontal stratification of the Polirschiefer (exhibiting, perhaps, the yearly or periodical deposition of the layers,) speaks also for a Neptunian action. Hot vapours of the volcanic neighbourhood might have much contributed to the purifying of the mass, without actual fire. The semi-opal of Bilin removes all doubt as to these organic relations.

"Very similar formations, with enclosed forms of organic origin,

state of existence, is progressive.* This progression is carried on to a great extent in nature, and, when we consider the multitudes of microscopic animals necessary to compose even the most minute stone on the sea-shore, the discovery of its infusorial nature becomes a subject of sur-

were also apparent in the semi-opal from Champigny,—that out of the Dolerit from Steinheim, near Hanau,—and that from the serpentine formation of Kosemitz in Silesia. The microscopical bodies enclosed in this stone, very apparently of a spherical form, and *never occurring larger*, which we also attached externally to the semi-opal, or hornstone, from Kosemitz, as a white meal, and filling out its internal cavities, might partly belong to the still existing genus *Pyxidicula*. They are quite different from the stalactitic columns which produce the round eyes in agate."—*Professor Ehrenberg on Fossil Infusoria.*

* "All stones, metals, and minerals, are real vegetables; that is, grow organically from proper seeds, as well as plants."—*Locke.*

Of the fossil Infusoria, Professor Ehrenberg also observes, "As botanists have often regarded these forms as plants, the following reasons why they are considered as animals, which I have already often pointed out, are deserving of remark: 1. Many Naviculæ, and other Bacillariæ, have quite a distinct, powerful, active, crawling motion, by which they move and push aside other bodies much greater than themselves. 2. The projection of an organ similar to the foot of a snail, and whose action assists in crawling, may be directly recognized in many forms. 3. By a close examination all the apertures may be seen, which may be considered as apertures of nutrition, of generation, and of motion. 4. Internal organs may be distinguished, which may be compared with the polygastric bladders of the infusoria, and others with the crowned ovary. 5. The infusoria are propagated, besides the highly probable egg formation, not by buds, as in plants, but also distinctly by *separation*, a method of propagation which is wanting in all decided plant-formations, but which is observed in many decided animals. 6. Some forms, whose motion is very slow, or which attach themselves, like oysters, afford no reason why they are therefore to be considered as plants."

passing interest to one and all the inhabitants of the surface of this globe.* The whole crust on which we dwell has been composed by them, and on

* "The millions of the tribe of infusoria have often been mentioned, and spoken of almost without consideration of their number, perhaps because little belief is entertained of their corporeality. They have often been regarded as drops of oil, and appearances of various kinds; but, since the Polirschiefer of Bilin must be acknowledged to consist almost entirely of an aggregation of infusoria in layers, without any connecting medium, these infusoria begin to acquire a greater importance, not only for science, but for mankind at large. The Kieselguhrs* occur, it is said, only in nests, about the size of a fist or a head, and probably may be of comparatively recent origin. With the Polirschiefer it is different; this forms widely extended layers, containing fossil plants and fishes. A single druggist's shop in Berlin consumes yearly more than 20 cwt.: the consumption, therefore, of infusoria, as tripoli, and for casting moulds, in Berlin and the environs, may be perhaps estimated at 50 to 60 cwt yearly, and thence we may in some measure infer the sale in Bilin. * * * * Passing over the share they have in the Rasencisen, the soldier cleans his arms with tripoli; the worker in metal, the locksmith, and the engraver polish with infusoria, which serve also for moulds in foundaries. These animals, which are so useful after death, and form entire rocks, have at present a more special interest in their individuality. The size of a single one of these infusoria, which form the Polirschiefer, amounts upon an average, and in the greater part, to $\frac{1}{288}$ of a line, which equals $\frac{1}{6}$ of the thickness of a human hair, reckoning its average size at $\frac{1}{48}$ of a line. The globule of the human blood, considered at $\frac{1}{300}$, is not much smaller. The blood globules of a frog are twice as large as one of these animalcules. As the Polirschiefer of Bilin is slaty, but without cavities, these animalcules lie closely compressed. In round numbers, about twenty-three millions of animals would make up a cubic line, and would in fact be contained in it. There are 1728 cubic lines in a cubic inch, and

* "A kind of siliceous paste; from Kiesel, *Silex*, and Guhr, a term used in mining, for water carrying dissolved minerals when in a thick liquid state."

them we are still dependent for a footing. Whence, then, did these minute beings obtain their existence, and on what does a continuation of that existence depend?

All matter being diamond,* and this substance

therefore a cubic inch would contain, on an average, about 41,000 millions of these animals. On weighing a cubic inch of this mass, I found it to be about 220 grains. Of the 41,000 millions of animals, 187 millions go to a grain, or the siliceous shield of each animalcule weighs about the $\frac{1}{187}$ millionth part of a grain.

"The animalcules of the Raseneisen are only $\frac{1}{1000}$ line in diameter, or the $\frac{1}{21}$ part of the thickness of a human hair, $\frac{1}{3}$ of the diameter of a globule of the human blood, $\frac{1}{8}$ of the blood globule of a frog. A cubic line of such *animal iron-ochre* would thus, in the same relation, contain one thousand millions, one cubic inch one billion, and one cube of nine feet diameter one trillion of living beings. If we suppose only one-fourth of this multitude to be really present, and take no notice of the other three-fourths, there yet remain such enormous numbers as to merit the greatest attention."—*Prof. Ehrenberg on Fossil Infusoria.*

* Diamond progresses in quality, from the purest and most pellucid drop of water to the hardest and most opaque flint.

"Hæmatites are found in many parts of Europe, sometimes forming whole mountains. The most extraordinary ores of this kind, both on account of their forms and of their various and brilliant colours, are found in the island of Elba, near the coast of Tuscany. The crystallized ores are here the most beautiful and the most common, though not to be met with anywhere else. They exhibit various gradations of the finest colours, as red, violet, blue, green, yellow, brown, and black; insomuch that, according to Coudrai's expression, they look like so many clusters of emeralds, sapphires, diamonds, rubies, and topazes. E. Peni and Mongez affirm, that these ores are mineralized only by the aerial acid; though Coudrai is of opinion, that they contain sulphur also. Besides these beautiful crystallized ores, this island contains also many others; being, indeed, little other than a group of iron mountains. The ores in general produce the very best kind of iron."—*Ency. Britannica.*

having from its very nature a tendency to form itself into a central mass or primitive egg, that egg being the centre and most solid portion of the sphere, would, of course, become the focus of all attraction,* and collect around its surface matter, in parts, like unto itself. Thus would the circumference of the primitive egg be studded with eggs, which, by pressing in every direction upon the parent egg, would cause it to stagnate or become degenerated, and in its nature changed. From cold to heat it gradually progresses, and generates a new form of matter, the fluid. Thus is the solid egg changed, from the perfectly compressed and most minute atom, into a fluid state, expanding, swelling, and causing a succession of steam to arise from the centre to the boiling point or circumference, and to fall externally from thence to the bottom or freezing point, gradually drawing the outward bound eggs, by means of the apex, into its stomach, and forming there a new centre or foundation egg in the midst of a minute fluid ocean.

Thus is formed to each part of the tissue a progressive line of gravitation, similar to that on the larger scale of the earth itself: the apex, or lowest portion of which, is always the seat of electricity,

* "The interior of the smallest animalculæ consists of bundles of silica or crystalline needles, in which there is no contractility."—*Dr. Grant.*

the highest, that of galvanism,—the heart or centre being the cavity whence the materials are ejected. The matter at the electric point is ever in a crystalline condition, and attracts solid particles analogous to itself, by electricity preserving the mass above in a fluid state of motion; this fluid matter forming a medium between the solid parts and the aeriform animal boundary* by which the whole sphere is netted together.

Thus were seas first formed, but small indeed in comparison with their present bulk. The first fluid in every sphere is produced by the combustion in its centre or cavity, and being ejected thence, creates its own aeriform or elastic boundary. The White, the Red, and the Black, were, probably, denominations given in the first instance to these fluids from a preponderance of the diamond, iron, or carbon, entering into the composition of the several distinct races of animal matter of which they were composed; the sea being the active source of all animal life.†

* "In all our journey through the Alps, as well when we climbed as when we descended them, we had still a river running along with the road."—*Addison.*

† Phenomenon of the Black Waters.—"In the upper part of the region of this river (the Orinoko, in South America), between the third and fourth north parallels (of latitudes), nature has several times displayed the singular phenomenon which has been named *black waters.* The water of the Atabaco, Temi, Tuamani, and Guainia is of a coffee-colour. Under the shade of the woods of the palm-tree their colour becomes of a deep black, but in transparent

The primary egg thus connecting itself by layers of its own material with the surrounding particles, gradually progresses to a state of perfect fluidity, forming to itself a distinct sphere, of which each part is governed by the same laws, and has similar modes of reproduction with the primary or central particle.

vessels it becomes of a golden yellow colour; the images of the southern constellations are reflected in it with singular brilliancy. The absence of crocodiles and of fish, a greater degree of coolness, a smaller number of musquitoes, and a healthier air, distinguish the region of the black rivers. They probably derive their colour from a solution of carburet of hydrogen, resulting from (the decomposition of) the multitudes of plants that cover the soil through which they flow."—*Malte Brun.*

"At two in the afternoon, on the 29th," Captain Cook says, "we made the land of the Cape of Good Hope. The Table Mountain, which is over the Cape Town, bore E.S.E., distance 12 or 14 leagues. At this time it was a good deal obscured by clouds, otherwise it might, from its height, have been seen at a much greater distance. We now crowded all the sail we could, thinking to get into the bay before dark. But when we found this could not be accomplished, we shortened sail, and spent the night standing off and on. Between eight and nine o'clock, the whole sea, within the compass of our sight, became at once, as it were, illuminated, or, what the seamen call, all on fire. This appearance of the sea, in some degree, is very common; but the cause is not so generally known. Mr. Banks and Dr. Solander had satisfied me that it was occasioned by sea insects. Mr. Forster, however, seemed not to favour this opinion. I, therefore, had some buckets of water drawn up from along-side the ship, which we found full of an innumerable quantity of small globular insects, about the size of a common pin's head, and quite transparent. There was no doubt of their being living animals, when in their own proper element, though we could not perceive any life in them. Mr. Forster, whose province it is more minutely to describe things of this nature, was not well satisfied with the cause of the sea illumination."—*Capt. Cook's Voyage towards the South Pole.*

Thus we have sea animals produced from land eggs, and new lands rising up again from the sea by the continual deposition of the sea animals,*

* New Island.—"The *Semaphore of Marseilles* states, on the authority of the captain of a brig sailing between Trafani and Girgenti, that an island was formed by a volcanic eruption in the middle of July, in that part of the Mediterranean. The phenomena are represented as being very striking. An immense mass of water was thrown up to the height of 60 feet, accompanied by a sulphureous smóke and great noise. The result of the sub-marine explosion is an island, in 37° 6′ north lat. and 10° 26′ east long. from the meridian of Paris. It is an active volcano, with a crater in its centre, whence lava flows. The sea all around is a hundred fathoms deep."—*Literary Gazette.*

A new Island in the Mediterranean.—" In a former number we spoke of the appearance of a new island in the sea. The following is an extract of a letter, dated Malta, August 5, 1832, giving further particulars:—' A new volcano has made its appearance between Pontellaria and Sciacca. The admiral's tender, the *Hind* cutter, returned here the day before yesterday, having taken thither and brought back Captain Senhouse, flag-captain of the *St. Vincent*, who brings the account that the island was rapidly increasing in size; when he left it was from a mile and a quarter to a mile and a half in circumference, and from 200 to 250 feet in height. The volcano was busily at work throwing up a vast quantity of materials, which resemble the lava from Vesuvius, being quite soft when fresh out of the crater, and becoming hard shortly after. The fall of the ashes rendered it difficult to land, but Captain Senhouse managed to do so, and planted the British colours, taking possession in the King's name. This, I imagine, was merely a matter of precaution, and to prevent any other nation (America for instance) from claiming a prior right to it, should it ever become an habitable island. I should not wonder if it disappears, as Sabrina did.' "

" There are now existing four active causes which contribute to alter the surface of our continents; the *rains* and *thaws* which lower our lofty mountains, and cast their relics at our feet; the flowing waters, which carry away their remains, and leave them in places where they retard their currents; the sea, which saps the base of the lofty coasts, and which forms the beach on which it casts the sand

each alternately acting for the assistance of the other.

The first race of animals consisted of the sponge

hills; and finally, the volcanoes, which perforate the solid layers, and elevate or scatter on the surface the masses which they vomit forth." —*Cuvier.*

"The memoir of Dolomieu on Egypt tends to prove that, in the time of Homer, the tongue of land on which Alexander built his city was not then in existence; and that they were able to navigate from the Island of Pharos into the gulf, and since called Lake Mareotis; and that this gulf was then from fifteen to twenty leagues long, as stated by Menelaus. The nine centuries, then, between Homer and Strabo were sufficient to bring matters to the state described by the latter, and to reduce this gulf to a lake of fifteen miles long.

"The cities of Rosetta and Damietta, built on the sea shores at these mouths (of the Nile), less than a thousand years since, are now two leagues distant from it. According to Demaillet, it would only have required twenty-six years to form a cape half a league in length in front of Rosetta."—*Ib.*

"Any person may observe in Holland and Italy how rapidly the Rhine, the Po, and the Arno, now that they are confined within dykes, raise their bed; how their mouths approach the sea by forming promontories at their sides: and can judge by these facts how few centuries these waves have employed in depositing the flat plains which they at present traverse.

"The Adige and Po are now more elevated than all the land which lies between them; and it is only by opening again new channels in the low lands, which they formerly deposited, that we can avert the disasters with which they now threaten us.

"The same causes have produced the same effects along the branches of the Rhine and the Meuse; and thus the richest districts of Holland have perpetually before them the frightful sight of their waters suspended above their soil at a height of twenty or thirty feet." —*Ib.*

"Many cities, which at well-known periods of history were flourishing sea-ports, are now several leagues inland; many have even been ruined in consequence of this change of situation. Venice can scarcely preserve the *lagoons* which separate her from the con-

or polype, of which all the varieties being united, formed but one animal :* from the decomposition of this animal (or whole generation in one) have

tinent; and, in spite of every exertion, she will one day become united to the main land.

"We learn from Strabo, that, in the time of Augustus, Ravenna was amongst the *lagoons*, as Venice now is; and now Ravenna is a league from the shore. Spina was founded by the Greeks on the sea-shore; yet, in Strabo's time, it was ninety stadia from it, and it is now destroyed. Adria in Lombardy, which conferred its title on the sea, and of which it formed, upwards of twenty centuries and more, the principal port, is now six leagues from it. Fortis has even reckoned it probable that, at a period still more remote, the Euganian mountains may have been islands."—*Ib.*

"The late M. Bremontier, inspector of bridges and roads, who made great researches on *downs*, calculated their progress at sixty feet annually; and in some places at seventy-two. According to his calculations, they (speaking of those in the Bay of Biscay) will reach Bourdeaux in two thousand years; and, from their present size, rather more that four thousand years must have elapsed since their accumulation commenced."—*Ib.*

* *Zoophytes.*—"The polypi are an extensive order of animals, and include the inhabitants of corals, madrepores, sponges, &c. Each hole in the coral, madrepore, or sponge is called a polype, in consequence of its being surrounded with the radiating filaments, or tentacula as they are called. There is very great difference in this tribe of animals. Many of the corals are joined together like the branches of a tree, leaving lateral apertures for the propulsion of the tentacula of each separate polype; one of the most remarkable of this class, is the isis hippuris, and the stem, is composed of membranous and calcareous parts disposed alternately, composing a jointed structure, and is capable of great flexure: this is commonly called jointed coral. After a certain time the gemmules break off from the stem and take root, a stem grows, and shortly after branches shoot out with fresh polypi. This lower class of zoophytes are in many respects analogous to the vegetable creation, but still the difference is very considerable. It is a question whether the several thousand animalcules, apparently living on one branch, are animated by the same volition: in point of fact, the question is one of individuality. Are we to consider the

been produced, in succession, races of polypi of a higher and improved species, still united as before in one: animal after animal (with its entire genera-

many thousand animals in the madrepore as being actuated all at the same time with the same motives? He thought that experience was against the supposition that there was but one animal."—*Dr. Roget's Lectures, Newspaper paragraph.*

"By the slow but constant destruction of rocks and mountains new and productive soils are formed to renovate the surface of the globe, and prepare it for the support of animal life: this appears to be the *final cause for which the world was created,* and to which all terrestrial changes ultimately refer."—*Bakewell.*

"It is, however, a curious but undoubted fact, that no inconsiderable portion of the earth's *surface* has been formed by organic secretion, and the process is still going on rapidly and extensively in the Southern Ocean. According to the observations of voyagers, islands and reefs of coral rocks are raised from vast depths in the course of a few years. Thus, millions of minute marine polypi are preparing future abodes for other classes of animals of larger size, and *living in another element.* From whence do these innumerable zoophytes and shell-fish procure the lime that, mixed with a small portion of animal matter, forms the solid covering by which they are protected? Have they the power of separating it from other substances, or the still more extraordinary faculty of producing it from simple elements? The latter I consider as more probable, for the polypi which accumulate rocks of coral from unfathomable depths have no power of locomotion; their growth is rapid, and the quantity of calcareous matter they produce in a short space of time can scarcely be supposed to exist in the waters of the ocean to which they have access, as sea-water contains but a minute portion of lime.

"It is now ascertained that lime, and the other earths are compounds of oxygen, united with metallic bases; and the brilliant discoveries of Sir H. Davy respecting the metallic nature of ammonia would lead to the conclusion that the metallic bases of all the alkalies and alkaline earths, which have many properties in common, may, like ammonia, be compounds of *hydrogen* and azote, but differently combined. Now, it is well known that hydrogen and azote, which exist as elementary constituent parts of almost all animal substances, may be derived from water and the atmosphere; and should the compound

tion complete in itself,) arising from the decomposition or destruction of the whole race or body of its predecessor. Thus has matter progressed

nature of the metallic bases of the earths be ascertained, the formation of lime by animal secretion will admit of an easy explanation."—*Bakewell's Geology.*

Coral. "A bit of ornament, and a bauble it is, I grant you; but remember that the coral insect, though a tiny little gentleman, is more important, in one respect, than Columbus himself. He is not a finder of islands and continents, but a founder of them. This thing, though but recently admitted to be a living creature, encroaches on the ocean itself—diminishes his dominion—increases the proportion of habitable land on our planet, and contributes, with the submarine volcano, to change the aspect of the world. The volcano, as an agent of nature, does his business with terrible despatch; he heaves up the bottom of the sea to a moderate distance from its surface, and there leaves a submarine rocky bank; but in a thousand instances this bank would never emerge from the ocean as an island, unless the little coral-insect set to work in building his house upon every hard substance that he can find at the bottom of the sea. When the first generation of these animalcules ceases to live, their structures adhere to each other by virtue either of the glutinous remains within them, or of some property in salt-water; and the intestines being gradually filled up by sand and shells, a mass of rock is at length formed. Future races of these animalcules erect their habitations upon the rising bank, and die in their turn, to increase, but principally to elevate this monument of their wonderful labours. An able voyager (Captain Flinders), who has written on the formation of coral reefs, observes, that 'the care taken to work perpendicularly in the earlier stages marks a surprising instinct in these diminutive creatures; for when their wall of coral, which is erected for the most part in situations where the winds are constant, is arrived at the surface, it affords a shelter, to the leeward of which their infant colonies may be safely sent.' To be constantly covered with water seems to be necessary to the existence of the coral insects, and, therefore, their habitations are always under the sea's surface. But above their habitations matter accumulates till it overtops the waves at low water; and this matter being exposed to the action of the air, loses its adhesive property, salt plants take root upon it, and a soil begins to be formed. Ere long the new bank

from the most simple up to its present complicated organization, until we have obtained a gradual formation of all the primitive rocks in which were bred, nurtured, and brought into existence, that most perfect work of the creation—Man.*

is visited by the sea-bird; by and by the nut of the cocoa, or the pandanus, is thrown ashore, and the wearied land-bird, resting his wings on the soil, deposits on it the seeds of herbs and trees. Every tide and every gale adds something to the bank, and it gradually spreads into an island of luxuriant vegetation. Man comes at last to take possession of the new estate, and he may well say, that the architecture of an insect has laid the foundations of his property."—*Campbell's Letters from the South, in the New Monthly.*

"An extraordinary phenomenon presented in the Southern Ocean may render our settlements in New South Wales of still more eminent importance. A SIXTH CONTINENT is in the very act of growth before our eyes! The Pacific is spotted with islands through the immense space of nearly fifty degrees of longitude, and as many of latitude. *Every one of these islands seems to be merely* a central spot for the formation of coral banks, which, by a perpetual progress, are rising from the unfathomable depths of the sea. The union of a few of these masses of rock shapes itself into an island, the seeds of plants are carried to it by the birds, or by the waves; and *from the moment that it overtops the waters it is covered with vegetation.* The new island constitutes, in its turn, a centre of growth to another circle. The great powers of nature appear to be still in peculiar activity in this region; and to her tardier process she sometimes takes the assistance of the volcano and the earthquake. From the south of New Zealand to the north of the Sandwich Islands, the waters absolutely teem with those future seats of civilization. Still the coral insect, the diminutive builder of all these mighty piles, is at work, the ocean is intersected with myriads of those lines of foundation; and when the rocky substructure shall have excluded the sea, then will come the dominion of man."—*Chambers's Edinburgh Journal.*

* "Life, which sought to possess itself of this globe, seems in these early periods to have struggled against the *inert* nature which first predominated; it was a long time ere it entirely gained the mastery

The successive links formed at the apex, by electricity causing an elevation of the superior part,*

it contended for, and appropriated to itself the right of continuing and raising the solid coating of the earth."—*Cuvier.*

* "Most of the active volcanoes being situated near the sea or great lakes, we may infer that *water* is in some way necessary to the production of volcanic phenomena. Boiling fountains and hot springs may be classed with volcanic phenomena; for it can scarcely be doubted that the Geysers in Ireland, which throw up columns of boiling water at intervals, to the height of seventy or eighty feet, are occasioned by the subterraneous fires which extend under that island; to the same cause must be ascribed the boiling fountains in the island of St. Michael's, one of the Azores. The hot springs in the vicinity of the Pyrenees, and in Italy, and other parts of the world, may, with much probability, be supposed to have a similar source of heat. The unvaried equality of their temperature for centuries, proves that *this source lies far below the agency of those causes which operate on the surface.* It has been remarked that hot springs are most frequent in volcanic and basaltic countries."—*Bakewell.*

Hot Springs at St. Michael's, one of the Azores. "Volcanoes are supposed to exist internally, of which, indeed, the fountains in the Valley of Farnan and other parts of the island, are evident symptoms. This valley is about twenty-five miles north and east of Porto del Gardo, and has on its south-east side a small village called Carcius or Farnan. On a small elevation, about a quarter of a mile square, are a number of hillocks, on which the action of fire is everywhere evident. The minerals on the spot are pyrites, lava, pumice, marble, and clay of different colours, ochre, iron-ore, and calcareous earth, mixed with alum and sulphur. There are also a number of boiling fountains, and many cold springs. The hot springs form several streams, and in their course they smoke and emit sulphureous steams; in a calm day the vapour is seen rising to a great height. The largest of these boiling fountains, called the Caldeira, is nearly thirty feet in diameter, but its depth is unknown. Its water is scalding hot, and in a constant state of ebullition, emitting a vapour highly sulphureous, and smelling like burnt gunpowder; its taste communicates an acescent pungency, and its sediment is a clayey substance of a light blue colour. At a few yards' distance, behind a ridge of lava, and at the bottom of a projecting rock, is another boiling fountain, called the

and forming clefts and divisions above,* on which the solar matter pressing downwards, produces every variety of colour, form, and quality.

Forga, or Forge; this is ranked as the second fountain: its surface is seldom visible, from the dense sulphureous vapour; it boils with great violence, and sends forth a great noise, throwing up quantities of a fine glutinous blue clay, mixed with vapour, which is scattered about, and observed to incrust the rock and other neighbouring objects. These are the principal fountains, but there are several others; and vapour is seen issuing out of the crevices of rocks in many places. By applying the ear to some of the fissures, the noise of boiling water is distinctly heard; and from others the water is at intervals squirted out, scalding those who may unwarily approach too near. The temperature of these fountains is not uniform; some are as high as boiling heat, others more moderate, and some very cold; the appearance of the water in some is limpid and transparent, in others turbid, of a white or reddish hue, *all generally depositing a red or blue clayey substance.* Crystals of alum and sulphur are here found in abundance, some of them beautiful and curious; and *when the vapour issues and exudes from the chinks and fissures of the rock, some of the crystals are from one to two inches long.* A small river runs through this valley, and on its edge, in several places, there are hot springs, with, at times, a perceptible ebullition in the middle of the stream from these springs. This river deposits an *ochrey* sediment on the stones and pebbles of its bed; in some places the sediment is of a green colour, not unlike martial vitriol; and the bushes on the banks are incrusted over with sulphur and alum. The taste of these waters varies. In some it is that of a strong impregnation of the vitriolic acid, in others of the carbonic; in others the taste is aluminous or ferruginous; while others, again, are perfectly insipid. The country people, in cooking, save fuel by those fountains. They place their culinary utensils over the hot springs, or upon some of the steaming crevices; and their cattle, by instinct or experience, approach these places to clear themselves of vermin, by standing in the sulphureous steam."—*From the Journal of the Geographical Society*, vol. 4, part 2.

"The substances emitted or ejected from volcanoes are either solid, fluid, or volatile."—*Bakewell.*

* "The partings or divisions in rocks, which may probably be denominated *rents*, are distinct from those which are the effect of

Our atmosphere is a composition of living animals, which , having worked their way up to their locomotive state of existence, move in all directions from the solid stratum of the earth to the boundary of its atmosphere, or point where the sun's materials are deposited: the region beyond the earth's atmosphere being the pure oxygen, or snow, which is ever gravitating to us.

All insects are formed chiefly from charcoal, having merely fluid diamond sufficient to cement their particles together: and they hover about all larger animals; indeed, the upper atmosphere is wholly composed of them, and the falling oxygen causing them to inflame, combustion is continually going on.*

Thus the boundary of this earth, or skin of the

crystallization, and may be distinguished by their irregularity, roughness, and the indeterminate manner in which they intersect the stone." —*Bakewell.*

* "In the north-eastern parts of Siberia, according to the description of Gmelin, the northern lights were observed to "begin with single bright pillars, rising in the north, and almost at the same time in the north-east, which gradually increasing, comprehend a large space of the heavens, rush about from place to place with incredible velocity, and finally, almost cover the whole sky up to the zenith, and produce an appearance *as if a vast tent were expanded in the heavens,* glittering with gold, rubies and sapphires. A more beautiful spectacle cannot be painted, but whoever should see such a northern light for the first time could not behold it without terror. For, however fine the illumination may be, it is attended, as I have learned from the relation of many persons, with such a hissing, crackling, and rushing noise through the air, as if the largest fireworks were played off. To describe what they then hear, they make use of the expression, 'the raging host is passing.' The hunters who pursue the blue and white

terrestrial fœtus, may be considered as divided into three distinct forms of matter, the solid or mineral, the fluid or vegetable, and the aeriform or animal. The first or lowest of the three portions is constituted of carbon, hydrogen, and oxygen, (with hydrogen *latent*); the second of carbon, hydrogen, and oxygen, (with the hydrogen *active*); the third of carbon, hydrogen, and oxygen, (the hydrogen being *locomotive*): it is the compression or

foxes in the confines of the icy sea, are often alarmed in their course by these northern lights. Their dogs are then so frightened that they will not move, but lie obstinately on the ground till the noise has passed. Commonly, clear and calm weather follows this kind of northern light. This account has been confirmed by the testimony of many, who have spent parts of several years in these northern regions, and inhabited different countries from the Yenisei to the Lena; so that no doubt of its truth can remain. This seems, indeed, to be the real birth-place of the Aurora Borealis."

"A person who resided seven years at Hudson's Bay, confirms M. Gmelin's relation of the fine appearance and brilliant colour of the northern lights; and particularly of their rushing noise, which he affirms he has frequently heard; and he compares it to the sound produced by whirling round a stick which is fastened by the end to a piece of string. A similar noise has likewise been noticed in Sweden. Mr. Nairne also, being in Northampton at the time when the northern lights were remarkably bright, is confident he heard a hissing or whizzing sound. Mr. Belknap, of Dover, in New Hampshire, North America, testifies to this fact. M. Cavallo says, that the cracking noise is distinctly audible, and that he has heard it more than once. Similar lights, called Auroræ Australes, have been long since observed towards the South Pole, and their existence has been lately ascertained by Mr. Forster, who assures us, that in his voyage round the world with Captain Cook, he observed them in high southern latitudes, though attended with phenomena somewhat different from those which are seen here."—*The Doctor Magazine.*

condensation of this last form of matter (hydrogen) which produces every variety of animal life. The carbon and oxygen falling from the sun, meeting the ascending atmosphere, an electrical combination takes place, and locomotive animal life is generated. Thus are produced all the parasitical races of animals, from the minute infusoria to the many and varied insect tribes: all preying one on the other, and labouring to effect the destruction of the internal fœtus or machine—the earth.

Combustion is nothing more than the destruction of one race of animals to rear up another upon its ruins.* The myriads of insects and feathered animals rising, as carbon, from the hydrogen thrown off by the earth, are destroyed by the falling oxygen;† and thus the atmosphere becomes

* "The great sharpness and clearness of all the outlines of all these siliceous shields || plainly appears to have been produced by an extraordinary red heat, which has evaporated all organic (particularly vegetable) carbon."—*Professor Ehrenberg on Fossil Infusoria.*

"Instead of dividing matter into *organized* and *brute matter*, the general division ought to be into *living* and *dead matter.* That *brute matter* is nothing but matter produced by the *death* of animals and vegetables, might be proved from the enormous quantities of shells, and other relics of living bodies, which constitute the principal parts of stones, marbles, clays, marls, earths, turfs, and other substances that are commonly reckoned *brute-matter*, but are, in reality, composed of decayed animals and vegetables."—*Buffon.*

† "The larva of the turnip fly is a small black caterpillar, having six legs, of about an eighth of an inch in length, being extremely active, and hopping about with great agility, so as to render it extremely

|| See note, page 317.

purified, to the relief of human vitality.* The descending oxygen, filtering through our atmosphere, destroys these carbonaceous animals, and is deposited as the dew-drop on the vegetable kingdom, to give fresh colour and life throughout all nature. The verdure of the grass is owing to this. It is this oxygen and its accompanying charcoal which produced the primitive rocks. It is this powerful and

difficult to catch. Towards the end of the summer it enters the earth, and there undergoes the change of form, coming out the pupa or beetle. When finely powdered lime was sprinkled over the turnips, the insect evaded it by getting under the leaves, whilst a solution of sulphate of potash so strong as to destroy vegetation, had no effect in arresting its ravages. It appeared that where the manure had been ploughed into the ground, immediately on its being placed in the field, the fly is found to abound; but that where the manure is placed on the ground in the autumn, and allowed to remain for a month or two before it is ploughed in, there are scarcely any flies seen."

* "There is scarce an insect without wings that is not obnoxious to man. The smallest have the power of annoying him, either by biting or stinging him; and though each is in itself contemptible, they become formidable from their numbers. But of all this class there is none so terrible as the scorpion, whose shape is hideous, whose size among the insect tribe is enormous, and whose sting is generally fatal."—*The Doctor Magazine.*

"The most mischievous animals here (New Zealand), are the small black sand flies, which are very numerous, and exceedingly troublesome. Wherever they bite they cause a swelling and intolerable itching, which at last brings on ulcers like the small-pox."—*Captain Cook.*

"What an uncomfortable life must the poor Laplander lead, since, at certain seasons of the year, the number of insects is so great, that a candle is no sooner lighted than the flame is extinguished by the multitudes that flock to it; where, after millions are destroyed, famished millions succeed, and renew the unceasing combat! Less injurious, though equally tormenting, are the musquitoes which infest the warm climates of Asia and South America. Even in Britain, which is happily free from these unrelenting invaders, much

all living oxygen that laid the foundation-stone of this immense planet: and, by the pressure of matter constantly increasing at its surface, that planet has become organized in the threefold state, solid, fluid, and aeriform, and eventually have been produced the immense ocean, rivers, lakes, hills, valleys, islands, and continents.

That there are two grand orders of existence must be quite evident; an ascending and a descending creation. While the former are working, in myriads, their insectorial existence, from the centre of every sphere to the surface; the latter are descending from the surface to the apex, where they enter upon an ascending state: the ascending race is that from which the fabric is reared; the descending or parasitical, that by which it is destroyed or decomposed.*

inconvenience is often felt from the sting of the hornet, the wasp, and the bee; and almost as much from filthy vermin, especially the bug."

Doctor Magazine.

* "Parasitical plants of different species, which attach themselves to trees and shrubs, feed on their juices, destroy their health, and finally their life, abound in all climates." *Davy's Agricultural Chemistry.*

"The insect tribes are scarcely less injurious than the parasitical plants. To enumerate all the animal destroyers and tyrants of the vegetable kingdom would be to give a catalogue of the greater number of the classes in zoology. Every species of plant almost is the peculiar resting-place, or dominion of some insect tribe; and from the locust, the caterpillar, and snail, to the minute aphis, a wonderful variety of the inferior insects are nourished, and live by their ravages upon the vegetable world. I have already referred to the insect which feeds on the seed-leaf of the turnip: the Hessian fly, still more destructive to

All animal matter progresses the same as the butterfly, which has three distinct successive stages

wheat, has in some seasons threatened the United States with a famine: and the French government is at this time, (January 1813,) issuing decrees with a view to occasion the destruction of the larvæ of the grasshopper. In general, wet weather is most favorable to the propagation of mildew, funguses, rust, and the small parasitical vegetables; dry weather to the increase of the insect tribes."—*Davy's Agricultural Chemistry.*

"There are four different species of the locust which are remarkably destructive. Almost every year whole provinces, the most fertile in Asia and Africa, are laid waste by their depredation. In Tunis and Algiers, swarms of the Gryllus Migratorius appear so numerous, that they darken the face of the sky like a threatening cloud. These pernicious animals are wafted there by the southerly winds in the month of April. In May they take their departure for the interior parts of the country, to propagate their young; these make their appearance in their larva or caterpillar state during the month of June, when they commit vast depredations. The first columns, which pervade the country like an army, destroy every green shrub and pile of grass; and their devastation has not ceased when they are succeeded by other swarms that press upon their rear, devouring the tender branches and stalks of plants which their forerunners had left. This dreadful visitation, which the language of Scripture has justly described as a plague, does not terminate till the insects have passed into their winged state, when they fly off, leaving the whole surface of the earth naked and brown, as if scorched by fire."—*The Doctor Magazine.*

"Creatures so small as locusts can strip, during one visitation, whole forests of their foliage, and destroy every trace of vegetation throughout an extent of several thousand square miles together; and, as was the case when the kingdom of Massinissa was thus scourged, cause upwards of 800,000 persons to die from famine. What are the ravages of beasts, what the desolation even of earthquakes and volcanoes, when compared to such an unsparing annihilation of men, brutes, and plants, by these powers of the air! Neither is our astonishment lessened, although its course be turned when we compute their sums, when we find the swarms of these insects to be so vast and dense as to overshadow large tracts of country, and even to intercept the light of day. One of these living clouds, which was three whole

of existence: in each transition or change it deposits its outward case or shell, which forms the bed, cave,

days and nights, without apparent intermission, passing over Smyrna, must have been, according to accurate observations made at the time, three hundred yards in depth, upwards of forty miles in width, and nearly five hundred miles in length. Captain Basil Hall calculated, that the lowest number of locusts in this enormous swarm must have exceeded 168,608,563,200,000; and, in order to assist the imagination, Captain Beaufort determined that this cloud of locusts, which he saw drifting by when he lay at Smyrna, if formed into a heap, would have exceeded in magnitude more than a thousand and thirty times the largest pyramid of Egypt; or, if they had been placed on the ground close together, they would have encircled the globe with a band a mile and a furlong wide!' Indeed, history tells us, that when these conquering legions are subdued by tempests, their bodies occasionally overspread large tracts of country, even to four feet in depth, and when driven into the sea, have formed a bank along the shore, three or four feet in height, and extending for fifty miles." *Saturday Magazine.*

"Little inferior to the locust in its destructive powers, is the Phalæna Graminis of Linnæus which destroys the meadows in Sweden. There the peasants are employed in cutting deep ditches in the surface, to stop the progress of the larvæ as they pass along. If the swarm be small, this device has the desired effect; but the numbers of these animals are often so great, that they fill up the trenches, and pass along over the dead bodies that are buried in them. The Formica Sacchilifera is a native of the West Indies, where it pervades the plantations of the sugar-cane, entering the plants, and destroying them when they are tender: after long experience of its depredations, the inhabitants have never been able to invent a method of destroying this pernicious animal. In our own country, the turnip-fly, the butterfly, the chafer maggot, the corn insect, *thrips physapus*, and the gooseberry worm, have long committed depredations in the fields and gardens, which no invention has hitherto been able wholly to prevent." *Doctor Magazine.*

"The pine forests of Germany have at various times sustained enormous injury from the attacks of a small beetle, called *Bostrichus typographus*, 80,000 larvæ having been found in one tree; and, as they feed on the soft inner bark, and multiply thus abundantly, whole

or resting-place for itself and successors: the parent-insect labouring to leaven the earth or bed

forests fall a sacrifice to their voracity, so that, in the Hartz alone, the trees destroyed were calculated at a million and a half; and the inhabitants of this extensive range of country were threatened with a want of fuel to continue their mining and smelting operations, and consequently with ruin, entirely dependent as they were upon those branches of the useful arts. Subsequently these *Bostrichi*, when arrived at their perfect state, in the form of winged beetles, migrated in swarms into Suabia and Franconia, there to commit similar ravages. At length, after repeated injuries, the powers of nature interfered to mitigate the evil, which want of scientific knowledge, as we shall presently shew, had allowed to gain so alarming a head. Between 1784 and 1789, in consequence of a succession of cold and moist seasons, the numbers of this scourge were sensibly diminished: it appeared again, however, in 1790; and, so late as 1796, there was great reason to fear for the few fir trees that were left.

"About sixteen years ago, the elm trees in St. James's and Hyde Parks suffered much from a similar attack, and whole rows were rapidly being thinned and disappearing, both in the Mall and Bird-cage Walk. As the persons who had the charge of the plantation were entirely ignorant of the true cause of the mischief, and as it was clear that the trees died in consequence of being completely stripped of their bark, rewards were at first offered for the discovery of the delinquents who so mischievously barked them; but these were offered in vain. It was observed, however, (and the observation claims some credit for its ingenuity,) that no more of any tree was barked from the ground than what was easily within the reach of a soldier's bayonet; and this was sufficient to throw suspicion on some unfortunate recruits, of whom more than one was arrested, without producing any diminution of the evil. In vain, too, were persons employed to sit up during whole nights, watching for the enemy; the bark continued to be found every morning at the roots of the trees, and the park-keepers, after all their trouble, could only conclude that the bark fell off in consequence of something being placed on the trunks in the day time. About the same time the elms in the grove at Camberwell, near London, were observed to be undergoing a similar process of destruction; and the proprietors being equally ignorant of its cause as in the instance just mentioned, the injury was ascribed

the production of a successor or future species, the seed of which, being contained within its own

to the effects of gas escaped from the pipes for lighting the road, which had just been laid down; and legal proceedings were actually commenced, for the removal of the nuisance, against the gas company which had undertaken the supply. Entomologists, it is true, were aware that the operations of insects were the cause of all this mischief; but unfortunately they were not believed until the disease had reached that pitch which threatened to make remedy hopeless. But at last a naturalist was consulted, and he at once discovered that an insect, called the *Hylesinus destructor*, had taken up its abode in the parks, and legions of little fellows were quietly and constantly at work, secretly proceeding in their labours of destruction, in spite and in defiance of Lord Sydney's denunciations. But not only did Mac Lean discover the cause of this evil; he, in the true spirit of philosophy, likewise directed a remedy to be applied, and these subtle miners became at once obedient to the voice of science, although they had defied the ranger's threats, to prosecute them with the utmost severity of the law."—*Saturday Magazine.*

"The honey-dew," says Mr. Thomas Hitt, in his work on the management of Fruit Trees, "is a glutinous substance, very prejudicial to many kinds of fruit trees, for it contracts the minute vessels of their most tender parts, and prevents their imbibing and perspiring such fluids as are required in vegetable life. A few days after the honey-dew appears, you may discover small insects on the underside of the leaves that are shrivelled, almost without motion; yet the heat of one fine day will make them visibly increase both in bulk and strength, and likewise in number." He adds, the honey-dew "retards the motion of the sap at the extremity of the branches, and this prevents the fruit below from coming to any tolerable perfection, and damages the young branches to such a degree, that they are never after capable of bearing good fruit. Besides, many trees are entirely killed thereby, if proper methods are not used to prevent it. Though different kinds of smother flies, or those of different colours, are found upon different sorts of trees, yet as they are all either bred from, or feed upon the honey-dew, all trees require the same care and management, to preserve them from these evils; for no tree prospers well when either the honey-dew or smother-flies are on the extremities of its branches.

"There is scarcely a plant that is not the peculiar *habitat* of one or

sphere by every organized animal, is always ascending from the earth-bed, and forming an

more distinct species, and often the same plant is infested by several species. The oak is frequented by a variety of other insects besides the numerous species of *cynips*, nor is this a solitary example, for it happens also to other plants. Furthermore, the insects themselves, or the diseases they produce, frequently become very important articles of food, medicine, and commerce: for example, the *coccus* (the cochineal insect), the *lac* insect, and the *cantharis* (Spanish fly), the gall apples of the *Silvia pomafera* (the apple-bearing sage), and the nut galls of the Levant."

"The belief that the disease called the itch, owed its origin to an insect, is by no means recent. The French term for the disease is *gale*, which etymologists tell us is derived from the Latin word *galla*, a nutgall; and the production of this astringent substance, used so much in the manufacture of ink, as well as other purposes not less important, is occasioned by exactly similar means.

"They are excrescences on a species of oak, called by botanists *quercus infectoria*. At the season of the year, when the young shoots make their appearance, a small insect (*cynips quercus folii*) deposits its eggs in them; when the maggot is hatched it produces an excrescence of the surrounding parts, nearly of a spherical form, which is the gall-nut; when mature, the maggot eats its way out, to undergo the ordinary but singular transmutations of insects of this kind."—*Ib.*

"In the observations of Mr. Brown on the *Rafflesia*, he remarks, that it is not common for parasitic plants to fix indiscriminately on the roots or branches of their stocks, as is supposed to be the case with the *Rafflesia*, and that plants parasitic on roots are chiefly distinguishable by the imperfect development of their leaves, and the entire absence of green colour, and their embryo not only minute, but apparently imperfectly developed. The modes of union between a parasite and its supporter or stock, vary in different genera and species of this class of vegetables. Some, as in the misletoe and *Rafflesia*, depend on the stalk for nourishment, during the whole of their existence; others, as in the common broom rape, are originated in the soil, and, afterwards, when they have attached themselves to their stock, and in their more advanced state, produce roots of their own. In some cases the connexion between the parasite and the stock is such as can only

enlarged and more perfect sphere above, inclosing the parent-insect and its earth-bed, as ashes, within the new circle.

Sir Charles Bell says, that "the living and dead tissues are very different." It is the dead tissue which forms the egg or seed-bed. Eggs may be divided into three species:

1st. The black egg, or seed of the infusoria or lowest animals.

2d. The red or improved grade, forming the annelida.

3d. The white or perfect, which produces the articulata or animals, (forming an irregular crustaceous mass.)

This earth is one continued series of all the parts of man; it is composed from his body, particle after particle being thrown off and collected; so that it is formed by decomposition.

The granite rocks may be considered as denoting the peculiar line of gravity in every sphere; these always grow perpendicularly to the surface, and were, prior to the flood, inhabited by the primitive

be explained in the supposition that the germinating seed of the parasite excites a specific action in the stock; and the result of which is a formation of a structure, either wholly or in part derived from the root, and adapted to the support and protection of the undeveloped parasite; analogous, therefore, to the production of galls by the puncture of insects. On this supposition may be explained the connexion between the flower of the *Rafflesia*, and the root from which it springs."—*Chambers's Journal.*

or black races: the destruction of these produced the secondary formations, inhabited by the red or improved grade, which last have been decomposed to form the white rocks with the present more perfect generation; the one ascending as the other descends in the scale of life.*

All the different strata, forming the beds of this earth, have, at different periods, been the coating of land animals, and the crustacea of fish.

It is a law of matter, that every animal from the lowest to the highest grade shall have a sphere of its own for the protection of itself, and the reproduction of its species or kind; and that each successive race shall be an improvement on its prede · cessor, until it has arrived at the highest progres-

* "Neither is there any remains of man. All the bones of the human race which we have spoken of, have been the result of accident, and, besides, their number is extremely small, which it certainly would not be if men had then been established in the countries inhabited by these animals. Where then was the human race? Did the last and most perfect work of the Creator exist nowhere? Did the animals which now accompany him on earth, and of which there *are no fossil remains to be traced*, surround him? Have the lands in which they lived together been swallowed up, when those which they now inhabit, and of which a great inundation might have destroyed the anterior population, were again left dry?"—*Cuvier, On the Globe.*

"I do not wish to conclude that man did not exist previously to this epoch. He might have inhabited some confined tract of country, whence he repeopled the world after these terrible events; perhaps, the places in which he dwelt have been entirely swallowed up, and his bones buried at the bottom of the present seas, with the exception of the small number of individuals who have propagated the species."

Ibid.

sive power its species is capable of attaining, when a retrograde motion in the animal takes place, and an imperceptible degeneracy comes on, bringing with it a gradual decay, old age, and death: putrefaction succeeds, and finally a separation of all its parts, which gravitate and fall to the earth again, as seed, for a new succession of a more perfect generation. Each generation or race of animals having a sphere of its own, this earth is a continued series of concentrated spheres, finally rising up to the apparently complicated structure of man: his body being based on the scum, froth, or lava occasioned by their purification, and enclosing in itself all the materials necessary to form the seed of his own sphere and create to himself a generation of perfect animals, after his own nature, the machine—man, concentrating and containing within his own circle every organized animal. The outward form of the existing animal is but the press, to harden, consolidate, and mould the internal parts into the perfect man, its future state of existence. All, all is man—ascending and descending alternately in the scale.

Thus, all living organized superior bodies are formed from whole organized inferior animal bodies: their dwelling-case or membrane consisting of disunited parts, which are continually separated and thrown off from the interior. All living animals, by

this means constantly changing their coating of skin, form again into masses living eggs, from which inferior animals are produced; the lowest grade being built from one egg,—the highest man from *all*. Every animal generates eggs sufficient for the propagation of a certain number of its own species. When those eggs are deposited, the animal gradually becomes callous and dies away, its body or carcase, by returning to its primitive state of crystallization and repose, forming the foundation-stone for a succeeding generation of a higher species of animal structure.*

Man is made up of parts, each part being itself an animal or living seed, ascending in the scale of his own creation up to a certain size, and descending

* During the course of his experiments on the generation of insects, Redi "ascertained the curious fact, that when the common fly dies, it serves as a nest for its own species, equally with any other kind of dead flesh."—*The Doctor Magazine.*

"The most insignificant insects and reptiles are of much more consequence, and have much more influence in the economy of nature, than the inaccurate are aware of; and are mighty in their effect from their minuteness, which renders them less an object of attention; and from their numbers and fecundity. Earthworms, though in appearance a small and despicable link in the chain of nature, yet, if lost, would make a lamentable chasm. For some quadrupeds which are almost entirely supported by them, worms seem to be the great promoters of vegetation, which would proceed but slowly without them, by boring, perforating, and loosening the soil, and rendering it pervious to rains and the fibres of plants, by drawing straws and stalks of leaves into it; and most of all, by throwing up such infinite numbers of lumps of earth called worm-casts, which being their excrement, is a fine manure for grain and grass."—*Natural History of Selborne.*

again;* having formed a complete chain or sphere of his own, he in his turn becomes entrapped and screwed up in the grave he has himself been digging.

The outward case of this earth is one continued muscle, or every species of animal linked together, forming one complete machine. When the centre moves, the whole mass moves also, all the parts being conjoined and acting in perfect unison.

Every animal being enclosed in a skin or outward case is constantly consuming his own machine.

> "Our birth is nothing but our death began,
> As tapers waste that instant they take fire."—*Young.*

By this state of combustion every organ is sepa-

* *Man in Embryo.*—"We commence," says Dr. Bourdon, "by being entirely liquid, in the bosom of a little egg, which serves us as a cradle and first origin; we afterwards appear under the form of a whitish fleecy spot. This little homogeneous mass, in which no organ is visible, appears about the twentieth day. It is like a worm in a mucous state, without any visible opening, two or three lines long, and deprived of motion; nothing yet is apparent, nothing to indicate a head, eyes, or members; at this period all is white, all is fluid, all appears uniform, and not organized. As soon as the organs do appear, every thing is symmetrical. At thirty days the embryo is the size of an ant, and of a honey-bee at forty days. At about the fiftieth day the members begin to appear, and the bones to ossify. At this epoch the human fœtus has a kind of *tail,* like quadrupeds. In fine, at first we resemble a kind of worm: we afterwards breathe by the *gills;* like the molusco, our skin is soft and naked, like theirs; after which we successively become fishes, reptiles, birds and mammalia. We resemble in turns all these different animals by several of our organs—by the brain, the heart, and the vessels, and principally by the skeleton; and it is only after having passed through all these gradations that the human fœtus at length differs from them all."

rated, evaporated, and condensed, until the whole machine or body is finally consumed, and falls again to the earth as dust and ashes. Thus it would appear to have been the original lot of man from the fall of Adam, to cultivate his parent soil, and, by this means, to change the elements of nature for the security of his own life, and the benefit of succeeding generations.* All the lower animals surrounding his body are formed from diamond, and by his labour and industry they are converted into carbon. By this means, he has given stability and

* "Linnæus called the Algæ, *Vernaculi*, or bond slaves, regarding them as being fettered to the rocks on which they grow. The title is particularly appropriate, and especially when applied to the lichens, which are, as it were, chained to the soil they labour to improve for the benefit of others, though from it they derive no nourishment themselves.

"The first conquests of life over death, the first inroads of fertility on barrenness, are made by the smaller lichens, which, as Humboldt has well observed, labour to decompose the scorified matter of volcanoes and the smooth and naked surfaces of sea deserted rocks, and thus to extend the dominion of vitality. These little plants will often obtain a footing where nothing else could be attached. So small are many, that they are invisible to the naked eye, and the decay of these when they have flourished and passed through their transient epochs of existence, is destined to form the first exuvial layer of vegetable mould; succeeding generations give successive increments to the soil thus forming, from which men are to reap their harvests, and cattle to derive their food; from which hereafter forests are designed to spring, and from which future navies are to be supplied.

"But how is this frail dust to maintain its station on the smooth and polished rock, when vitality has ceased to exert its influence, and the structure that fixed it has decayed? This is a point which has been too generally overlooked, and yet which is the most wonderful provision of all: the plant, *when dying, digs for itself a grave, sculptures*

growth to the earth he inhabits and in the end will form for himself an imperishable rock.*

in the solid rock a sepulchre in which its dust may rest. For chemistry informs us that, not only do these lichens consist in part of gummy matter, which causes their particles to stick together, but that they likewise form, when living, a considerable quantity of *oxalic acid; which acid, when by their decay set free, acts upon the rock, and thus is a hollow formed, in which the dead matter of the lichen is deposited.* Furthermore, the acid, by combining with the limestone, or other material of the rock, will often add an important mineral ingredient to the vegetable mould; and not only this, the moisture thus conveyed into the cracks and crevices of rocks and stones, when frozen, rends them, and, by continual degradation, adds more and more to the forming soil. Successive generations of these 'bond-slaves' successively and indefatigably perform their duties, until at length, as the result of their accumulated toil, the barren breakers, or the pumice plains of a volcano, become converted into fruitful fields."—*Professor Burnett's Outlines of Botany.*

* *City Antiquities.*—During the recent excavations in the City, more particularly for the formation of the sewerage in Newgate street, and the foundation of the new school at Honey-lane Market, a great variety of interesting relics of antiquity have been discovered by the workmen, which, viewed collectively, throw a great deal of light upon the ancient history of the metropolis. A large number of these specimens have been placed in the very extensive Geological Museum of Mr. Saull, in Aldersgate street, a gentleman of great antiquarian and and scientific research, and which he has chronologically arranged, forming a very interesting and connected series of illustrations. The excavations in Newgate street, carried on to a depth of about thirty feet below the surface, went underneath the whole of the foundations of the ancient cities. And above the solid diluvium, left by deposition from the river, there were observed the successive debris of the British Roman, and later London. The lowest was repeatedly seen at a depth of between nineteen and twenty feet below the surface, consisting of cinders and charcoal, the probable remnants of the destruction by fire of the rude wigwams or wooden huts, forming the first settlement of our British ancestors, where likewise a great quantity of human bones were found. Above these were found specimens of Roman and Samian pottery, consisting of vases, lachrymatories, amphoræ, &c.,

By the internal and external combustion of our earth, its materials are converted into carbonic acid

many of which are in a fine state of preservation, retaining in legible characters the names of the makers; coins of the Emperors Constantius, Constantinus Pius, Antoninus Pius, Nero, &c., a large quantity of vitrified tiles, &c.—Near the end of Newgate street, approaching to Snow-hill, at a depth of about twenty feet, the workmen met with an obstruction, which, from the hardness of the materials, for some time impeded their labours, and which, on examination, was found to consist of large solid blocks of chalk, cemented with an infrangible kind of grouting. On penetrating through, they entered a large magazine of human bones, loosely impacted together. From the direction of this wall, and the position of the bones not leading to the idea that this was a place of sepulchre, the probable conjecture is that it was an ancient City boundary, and the latter are the relics of an army, who, attempting to force the portals, and perishing there, were afterwards loosely covered over. In the excavations at Cheapside, at a depth of about eighteen feet, imbedded amongst many pieces of pottery and tiles, and what is supposed to have been the ruins of a Roman dwelling, was found a skull, now in Mr. Saull's collection, in a remarkably fine state of preservation, but which, phrenologically speaking, from the absence of the intellectual and great predominance of the animal organs, can give no exalted ideas of the moral character of the people to which the possessor belonged, the head being more like that of a Carib than of one of the natives of modern Europe. In the excavations at Honey-lane Market, likewise, a great many human bones have been found, in all probability, of very great antiquity from the immense quantity of Saxon coins which were also discovered there. Near the same spot were also discovered a great variety of tiles and pavements of the period of the Plantagenets, many of which, from the inscriptions on them, must have formed the foundation of some sacred place. From the chronological arrangements founded on these data, it would appear that the site of London must have been raised at least twenty feet from its first foundation, the ground occasionally rising by the aid of floods from the river, but the debris being most materially increased by conflagration to which the city was formerly so subject, and particularly at the "Great Fire of London."—*Newspaper Paragraph.*

Spontaneous Combustion. "The conflagrations here referred to are

gas, which, at a certain number of degrees below our freezing point, is by crystallization restored to its original purity, as the diamond. In page 244, I have shown the manner in which these materials, by the decomposition of the surface or animal boundary prior to the flood, planted successively the several internal organs of the earth, ascending to the point of levity to form a base or ovum for the brain. Since the flood the decomposition of the external membrane has been appropriated to the purpose of enlarging the internal machine, and enabling it to become perfectly organized in its several parts; each of these parts, like the primary, forming to itself distinct organs of its own. It is, indeed, apparent to the naked eye, that the

still common in many of the vast and impervious forests of the Northern regions. M. Acerbi has given a particular and spirited account of those of Finland, which often originate from an unassignable cause. 'I saw in this forest,' says he, 'the disastrous wreck of one of those conflagrations which had devoured the wood through an extent of six or seven miles, and which exhibited a most dismal spectacle. You not only saw trunks and large remains of trees lying in confusion on the ground, and reduced to the state of charcoal, but also trees standing upright, which, though they had escaped destruction, had yet been miserably scorched; others black and bending down to one side, whilst, in the midst of the ruins of trunks and branches, appeared a group of young trees, rising to replace the former generation, and full of vigour and vegetable life, seemed to be deriving their nourishment from the ashes of their parents.'"—*Travels through Sweden, Finland, and Lapland*, 4to. vol. i.

"See dying vegetables life sustain,
See life dissolving vegetate again;
All forms that perish other forms supply,
By turns we catch the vital breath and die."—*Pope.*

moon now resembles a human head; its organs must, therefore, be seven in number: eyes, nose, ears, &c., being formed in distinct succession by repeated layers of fluid matter thrown off from the primary or brain; the whole mass constituting the moon being enclosed by an elastic membrane or web of life, (its animal boundary:) this membrane, which is connected with the whole of the terrestrial machine, is the medium by which it receives its external nourishment.

> "Star of the earth, and diamond of the night!"
>
> *Dr. Darwin.*

The lunar body, as it revolves around the earth, purifies the latter by absorbing its rejected materials; these rejected materials consist of carbonic acid: as the moon falls or gravitates from its original position, the boiling point, it increases in weight, by the addition of this matter on its surface; having reached the opposite extreme of its orbit, the freezing point, it ascends by its own levity. This accumulation of matter by the moon is, of course, regulated by the decomposition or disorganization of the earth's surface. Such being the case, it becomes a question of considerable importance to ascertain the precise state of the latter in this present period. In order to do this, let us take a retrospect of the changes which have been going on in man himself since the period of the general deluge.

It must be generally admitted that there have been great alterations in the human race. Man has now lost the solidity and muscular strength by which he was distinguished in the earliest periods of this earth's existence: animal life being always correspondent with its base, we find the fluids struggling to predominate over the solids, and the hardy iron race of animals few in number. Instances of the longevity and strength of mankind have indeed occurred at intervals, even down to these our modern times; but such records may be considered as forming an exception to the general characteristics of the race, and not as its most striking feature. Man has long since passed his standard of strength: he is now on the decline; each successive generation becoming more enfeebled in body and dwindled in stature, even to the most minute form. Life is in the blood of man, and that life is the pure iron or oxygen: as man loses the iron contained in his blood he becomes lighter, and, like the earth itself, rises in the scale of creation: he not only becomes lighter, but shorter in stature, and, gradually losing his colour, from being a perfect black, he will, in the next period of his existence, become the perfect white. Instead of being now enabled to live, as he is stated to have done in his greatest strength, for hundreds of years, it is estimated that man does not, upon an average, survive his forty-fifth year. It is indeed obvious that there has been

a decrease of longevity even during the last few generations.*

The mind of man, however, perhaps compensates for his want of bodily strength. He is daily advancing towards his Creator by his inventive genius and mechanism: he is the only animal that has acquired the perfect ascendency over fire; not contented with gaining a sovereignty over this most powerful element, he is acquiring the means and knowledge to prescribe bounds to it. Man is now dealing in primitive matter: he is wielding the same mechanical instruments as his Maker; and this encourages my opinion, that with the present race of human beings will terminate the fœtal state of existence of this earth.

Whatever man undertakes is for his own individual good. It is through his labour that the materials of this globe are gradually heated up to the living flame. It is through his labour that the stagnant earth is changed into a living animal, gradually ascending in the frozen universe. God is the architect; He soweth the living seed: man cultivates, manures, and renders the soil productive:

* "After the flood, the state of things was perfectly reversed, the surface of the earth was covered with dead and putrifying land animals, and fishes, which copiously absorbed the oxygenous part of the atmosphere, and supplied only mephitic and fixed air. Thus the atmosphere was probably brought to its actual state, containing little more than one-fourth of pure air, and three-fourths of mephitic. Hence the constitution of men must have been weakened, and the lives of their enfeebled posterity gradually reduced to their present standard."—*Kirwan's Geological Essays.*

according to the labour so will be the product; for

> "Human life
> Is but a loan, to be repaid with use."

Man himself may be considered as placed in the centre of every sphere: he is the medium between the heavens above and the earth beneath. The upper part of his sphere, or galvanic, being the point at which the sun's materials are deposited: the opposite extreme, or lower point, the apex or electric. In proportion to the acquisition of matter at the former is man enabled to throw off his superabundant particles, by his skin or outward boundary; thus is an ascending creation, on the most minute scale, formed. These ascending races are destroyed by the falling oxygen, and the descending race, or parasitical, produced, which gravitates to the apex of the sphere, there to be reunited and worked internally by electricity up to the surface or atmosphere again, in a new and improved form. Of all the changes which take place on the surface of this earth, *man himself is the primary cause;* he is the daily labourer, and is constantly decomposing and reproducing *animal machinery*. All the visible objects around him are the works of his own hands. It is he himself that is labouring by the sweat of his brow to rear up this grand piece of human architecture, to be consolidated upon the dissolved materials of his own fabric or machine. It is he himself, I repeat, that is labouring with

all his muscular strength to achieve the grand catastrophe. Let him look to it, and see that he does not oppress another by his desire of self-interest:*

* "In the recently published letters of the late Mr. Sadler a curious calculation is made, which runs strangely counter to the generally received impression, that human life is now of longer duration than formerly. He mentions that in the manufacturing districts the mean duration of human life, calculated upon the mortuary registers of 1830, 1831, and 1832, and making no deductions for the ravages of the small-pox in former times, is less than it was in the corresponding years half a century ago. This he illustrates by tables of the deaths in the town of Leeds in the years just mentioned, and in the years 1780, 1781, and 1782, which appear to support his assertion. The cause is ascribed to "the deleterious nature of the present system of employment and labour, and the consequent habits and conditions of the people."

The following review of a work, entitled "Effects of Arts, Trades, and Professions, on Health and Longevity," written by Mr. Thackrah, illustrates the point in question.

"Civilization, of which we boast so much, has been defined to be the misery of the many for the luxury of the few; and truly, while turning over the leaves of this book, one cannot avoid bitterly deploring the undeniable fact that so many of our fellow-creatures are condemned to lives, not merely of almost unceasing drudgery, but to disease, repeated sickness, and early death, in the production of the various articles of ornament and fancy that custom or fashion has rendered indispensable:

'Here, while the courtier glitters in brocade,
There the pale artist plies the sickly trade.'

"A work like the present cannot fail to be of great service to the cause of humanity, for in many instances the author points out simple precautions by the adoption of which persons engaged in unhealthy avocations may, in a great degree, avoid the effects of noxious exhalations, bad air, confinement, &c.," and it is to be hoped that the attention of scientific men may be more closely directed to the subject. Moreover, the book may warn parents against devoting their children to avocations of an unhealthy nature, and thus, by lessening the numbers of those engaged in destructive trades, increase the wages of the

no one can labour for himself alone. *The sum-total of man's labour, when united, will amount to the production of one perfect individual.*

men that are already employed in them, for it is a singular fact that the most unhealthy "callings" are not the best remunerated. The reader will be surprised to find that many trades reputed to be unhealthy, are decidedly the reverse; while in other cases imagination could hardly have exaggerated the debilitating—the ruinous effects on the constitution, of avocations already known to be of a sickly character. Take as an instance the following afflicting details of the *dreadful effects of the white lead manufacture.*

"'The manufacturers of white lead are subjected to its poison, both by the lungs and the skin. The dust and exhalation are most from the white beds and the packing; little from smelting. There is only stench from the grinding, and neither dust nor smell from the blue-beds. Such, at least, was the statement of the managers of an establishment at Hull; for we were not permitted personally to inspect the process, though we examined the men. In several departments the heat is such as to produce sweating. Drinking, however, is less than in many other hot employments; and white-lead preparers are not, as a body, intemperate. In all departments the men and women are sallow and thin, and complain frequently of headach and loss of appetite. The effects of the lead are most marked in the white-beds and packing departments. Here, men soon complain of headach, drowsiness, sickness, vomiting, griping, obstinate constipation; and to these succeed colic or inflammation of the bowels, disorders of the urinary organs, and, finally, the most marked of the diseases from lead—palsy. We observed the muscles of the fore-arm more frequently and sooner to suffer than other parts. The eyes are also affected with chronic inflammation, or reduced nervous power. Persons commence the manufacture about the age of twenty; many soon leave from broken health; those who endure the employ, do not remain, on the average, longer than the age of forty-five; and during one-third of these twenty-five years, the men are laid up in bed, or decrepit from colic or palsy. The oldest man known in a large establishment at Hull, we found to have attained the age of fifty-four; but he is now unable to work. It is sixteen years since he entered the employ, and during this period he has been laid up twenty-eight times from serious

It has been observed, that within the last fifty years our climate has undergone a serious change for the worse; from a steady and regular to an uncertain and irregular course; so much so that one season trespasses on nearly the whole of the succeeding season.* Snow and hail, with violent

disease! Each attack has been worse than its predecessor. He has been, on one occasion, nineteen weeks in bed, with scarcely the power of stirring a limb, and was a month without any evacuation from the bowels. This miserable man is now partially paralytic; he has scarcely any motion in either wrist, and his lower extremities are so weakened that he can scarcely trail himself along, even with the aid of a crutch. His haggard countenance and emaciated frame give the appearance of the age of eighty, rather than of fifty-four. No person can be a month in the worst department without a serious attack of disease. Drunkards suffer most. One of them was said to have been suddenly seized with violent insanity while packing lead, and to have died soon after. Persons do not work in the lead manufactory more than five days a week on the average; and as no man could be induced to remain in the destructive department, there is a regular change of duties. Thus, though none are destroyed, all are exposed in turn to the most baneful process.'"

* *Change of Climate.*—"M. Arago, of the French Institute, has recently published some observations respecting the change of climate in France and elsewhere, from which it appears to be established that in several parts of that country the summers are colder now than they were formerly. He proves his position by showing that in various districts where the grapes in former times became perfectly ripe, they do not now ripen sufficiently to be used for wine of any description. M. Arago instances Macon among other departments. In 1553 it appears that wine was made of the Muscat grape at a village near the town of Macon itself, and that it is now impossible to make wine of the Muscat grape, as it does not ripen sufficiently. The vineyards of Etampes and Beauvais were at one time celebrated; but, according to a report made in 1830, no wine can now be made in the whole department of La Somme, in which those places are situated. M. Arago also instances the same change of climate in England, as he says it is

storms, for instance, have produced more frequent convulsions on the earth's surface. Famines, pestilences, and earthquakes,* have occurred in

proved by old chronicles, that at one time vines were cultivated in the open fields throughout a large extent of the country, and that now it requires great care to bring grapes to proper maturity in the open air. After stating these general facts, M. Arago enters into an inquiry into the causes of this change of climate, taking it for granted, as admitted, that a very marked change of climate has taken place both in France and England. 'The cause,' says M. Arago, 'is certainly not connected with the sun, a proof of which is given in the steadiness of the temperature at Palestine.' 'Some persons,' he adds, 'believe it to be caused by an unusual extension of the ice of the Arctic Pole by a general movement, which, after having drawn with it these masses of ice several degrees towards the south, has carried them towards the coast of Greenland, where they have united. This hypothesis, he says, is supported by the fact that, when the eastern coast of Greenland was first discovered, towards the end of the 10th century, it was entirely free from ice; but that still he does not believe the hypothesis is well founded, as there was very hot weather after the formation of those masses of ice upon the coast of Greenland.'"

* "An earth quake occurred at Canton, in China, on the 16th of September, 1831. It is noticed as an uncommon phenomenon in that part of the globe. The shocks continued about six or seven seconds, producing in that time about the same number of regular oscillations, or horizontal movements, in a direction from north to south, and *vice versâ*. No damage was done by them."

The *Zara Gazette* of the 24th ult. has the following:—"By accounts from the interior of the country, we learn, that, on the night of the 1st, an earthquake was felt in the direction of from north-east to south-west. The shocks, which were at first slight, became so violent that persons who were standing upright were thrown to the ground, and were unable to recover their equilibrium while the phenomenon endured. The isles of Lezina, Curzola, and Lissa, experienced violent shocks, but no place suffered so much as the village of Slivno. Situated on the sea-shore, to the south-east of fort Opus, some houses were totally destroyed, and from the greater part of the buildings the tiles were shaken. A circumstance worthy of remark is, that this phenomenon was not indicated by any of the

divers places, not excepting even this our own favoured isle, in unaccountable number. These

usual forerunners. The dogs did not bark, nor did the horses neigh; but the greater part of the inhabitants were some hours before awoke out of their sleep. This earthquake was followed by a hurricane, which lasted some hours."—*Galignani's Messenger, January*, 1833.

Earthquake at Mansfield.—"At five minutes past three o'clock in the afternoon of Saturday last, a smart shock of an earthquake was felt here; the streets were immediately thronged with persons, who had run out of their houses, imagining they were coming down. The shock appears to have been most violent in West-gate, and in the Lawn, (in the latter place two or three women were so alarmed as to faint away,) and seems to have been confined to a few miles round Mansfield. We are informed it did not extend beyond the village of Kirby, where it was severe. At Sutton-in-Ashfield, Skegby, and Pleasley, it was also felt very smartly. At Mansfield Woodhouse it was less severe than at Mansfield, and at Warsop it was felt still less. We believe it did not extend to Farnsfield. At Bilsthorpe the shock was not perceived; but a noise like unto the rushing of a mighty wind among trees on the mountain-top was heard. The shock was perceived at Harlow Wood, about two miles and a half from Mansfield, on the Nottingham road, but was not felt at the Hut. It may, perhaps, be worth remarking that Kirkby, where the shock appears to have been first observed, is in the neighbourhood of collieries, and the shock was principally confined to the coal and lime-stone districts. The day was a fine one, with a brisk S.E. wind, and light clouds flying about; but there was not anything in the atmosphere indicative of a storm, or of this awful visitation. Happily, we believe, no material damage was sustained."—*Nottingham Journal, July* 10, 1833.

Earthquake.—"We understand the shock of an earthquake, which we noticed in our last as having been experienced on the morning of the 30th ult. at Carmarthen and other places, was also felt in this city. By members of a family residing in Park-place, and who had not risen, it was distinctly felt, the clock time of the house being half-past eight. By one of the family of Mr. Cole, governor of the county gaol, who, being an invalid, was still in bed, it was distinctly felt, as well as by other persons in different parts of the city; but by those who had risen, the shock or vibration seems not to have been noticed. Out of doors no peculiarity was observed; at nine that morning the barometer

events are only presented to the public at intervals through the medium of the press: when collected

of the Devon and Exeter Institution measured 29.90; the thermometer 40; the wind at N.E., and the weather foggy."—*Exeter Gazette*, 1833.

"At about twenty minutes before three o'clock on Thursday morning last, a sudden and rather violent trembling of the earth was felt at this place (Portsmouth), which produced feelings of awe in many persons. Its effects were more visible at Chichester, Emsworth, Havant, and Purbrook, where in many of the houses the convulsive motion shook the furniture, and appeared to threaten destruction to the premises, the inmates becoming so greatly alarmed as to run to and from each other's bed-rooms for aid and shelter. A shock of similar violence and duration was felt at this place about twenty years since, in the afternoon of a fine day."—*Hampshire Telegraph, Jan.* 1834.

Earthquake in Cephalonia.—Extract of a letter from Corfu, dated July 26, 1834: "We have had the weather extremely hot; the thermometer in the shade at 86, with hardly any wind to cool the air. On the 5th of June we were lying in Cephalonia, when we felt a very severe shock of an earthquake about four in the afternoon. It was a very fine day, and I happened to be on shore at Lixuri, the opposite side of the harbour to where the ship was lying. Suddenly I heard a loud rumbling noise, and felt the ground trembling under my feet; it felt as if it was going to sink in. There was immediately an immense rush into the street, and in less than a minute I saw at least 3,000 people on their knees praying, crossing themselves, and a great many prostrate on the ground kissing the earth. It was with difficulty that I kept on my legs. A great many houses were cracked from top to bottom, and some fell down altogether. The only accident, however, which I heard of was of two girls, about twelve years of age, having their legs broken by the falling in of a wall. Earthquakes are of frequent occurrence in Cephalonia, but it is many years since they have had one so severe in its effects. The damage done is very heavy. Many large and good houses are threatening to tumble down every day. There was not the least appearance in the sky to indicate what was going on, nor was there any rise or fall of the sea."

Earthquake in Jamaica.—By a letter from Jamaica, dated the 7th of September, 1834, it appears that "the town of Kingston had been visited by a severe shock of an earthquake. The weather for several days had been very hot, the thermometer as high as 96 and 98 in the shade,

into a mass they assume a more startling aspect. Under this impression some of the appalling pheno-

with tremendous thunder and lightning, and very heavy rain. About half-past one in the morning of the 7th, the earth was violently convulsed by about eight or ten distinct undulations, the force of which appeared gradually to diminish until the last, when the phenomenon was concluded by a shock more severe even than any of those which preceded it. The duration of the earthquake exceeded that of any former one, being fully 30 seconds. We are happy to state, however, that no serious mischief has been done by it at Kingston."

Earthquake in Hungary.—The Austrian journals give the following account of the natural phenomenon which occurred near Lake Platten:—"Szolos Gyork, Feb. 10, 1836.—Yesterday morning we had a heavy fall of snow, so much so, that by mid-day the snow was one foot and a half deep. Meanwhile the roaring of the waters of Lake Platten were frightful, and the waves rose to a great height. Towards mid-day the lake became calm, and a strong south-wind then suddenly setting in, quickly annihilated the great masses of snow under which many cattle had been buried, but were now partly rescued. This was followed, about three o'clock in the afternoon, by a terrific thunderstorm, accompanied by a violent tempest, intermingled with drizzling snow, during which a man who was going to a neighbouring forest, and two others, who were sitting at their own firesides, were struck by the lightning. Towards five o'clock all seemed to be over, not the slightest atmospheric movement was observable, when, on a sudden, a great subterraneous noise, which was immediately succeeded by a violent earthquake, terrified all the inhabitants, who fled from their dwellings. Several houses were rent, and others thrown down. The lake Platten, twenty square miles (German) in extent, was, and is still, covered with a dark mist; in many places the water appears to bubble, as if it were boiling, and, what is very remarkable, several dead fish were last night cast ashore. But what is worse than all that has yet been related, is the fact, that the inhabitants of the valleys, Latizang and Triz, with their flocks, are compelled to leave their homes, because those places, since the earthquake of yesterday, have become completely overspread with a thick fœtid vapour, and in the plain, flames are seen to arise from the earth. We are in the greatest consternation here; the lake is again much agitated

mena alluded to, have been selected from the public journals, and submitted to the notice of the reader.

to-day (nine o'clock in the morning), and the waves swell to an immense height."

The *Gazette of the two Sicilies*, of the 28th ult., gives some long details of the earthquake that laid waste the district of Rossano, in Calabria Citerior, on the night of the 24th April:—"The two communes of Rossano and Crosia suffered the most; scarcely a single house remains standing; 192 individuals lost their lives by the disaster, and 240 were more or less badly wounded. The inhabitants of whole communes, having at their head a magistrate and a surgeon, were seen coming to the aid of the sufferers, and some terrible scenes took place as the bodies of the dead were dug out from the ruins. Public beneficence was strongly excited by the event. According to some accounts, but which may have perhaps been exaggerated, a meteor was seen along the shore of Calopezzati, like large burning beams of wood; long and deep crevices tore the land in the country; the sea retired 40 paces from the shore in one place, and overflowed another part to the same extent: on the shore volcanic substances were afterwards found, and fish, of species entirely unknown to the fishermen of the country. The same shock was felt at Ginosa, in the province of Otranto, and at Craco, in the province of Bassilicata, where some edifices were overthrown."—*June*, 1836.

"The *Neapolitan Gazette* of the 7th November, 1836, has an account of the destruction of Castiglioni by an earthquake, and of the burial of nearly one hundred inhabitants under the ruins, in the middle of the night of the 12th of October. The shock, it appears, was generally felt in Calabria and Citra. Castiglioni, a commune in the district of Cosenza, was levelled to the ground, and 100 inhabitants (the population is estimated 1,200,) met an untimely death. Many of them, in attempting flight, were seriously wounded by the falling of the houses. The small village of Ravella, with a population of 370 persons, met a similar fate, though with only the loss of two lives and about thirty wounded. In Leppano, a family of nine individuals were buried in the ruins of a fallen house. In Rende two were killed from the same cause, and one in Casole. The buildings in Cosenza and the capital of the province were very considerably damaged, but fortunately no lives were lost. Calamitous as this event may appear, it is little to be compared with a disaster of the same kind which

There has been also a vast increase of coal, iron, and metals;* the earth indeed appears to be gradu-

befell the other Calabria in the year 1783, when a great part of which, as well as Sicily, was destroyed, and about 40,000 of the inhabitants, in the surrounding towns and villages, perished."

"The Mediterranean mail, which reached London this morning, February 28, 1837, furnishes advices from Alexandria to the 8th of January, Malta to the 7th, Malaga to the 15th, Gibraltar to the 17th, and from Cadiz to the 18th instant. Saffet, one of the four principal cities of the Holy Land, containing a large population, was visited by a severe earthquake on the 1st of January, at six o'clock, p.m., which destroyed the principal part of the town, burying two-thirds of the inhabitants under its ruins. Several of the adjoining villages have totally disappeared, and the loss of life is said to have been many thousands. At the moment this convulsion of nature occurred in Egypt, the violent storms and hurricanes, it will be remembered, took place in the Mediterranean, especially at Gibraltar, where the shipping sustained much damage. The advices from Tripoli state that the plague was on the increase there, and the mortality very great."

"Letters from Constantinople, of the 25th ultimo, mention the occurrence of most dreadful earthquakes in Southern Syria. Safad, Tiberias, Naplooz, St. Jean d'Acre, and almost every town and village in that country, had more or less suffered from the shocks, and 15,000 persons at least had lost their lives on the occasion. A severe shock had likewise been felt, at Constantinople, on the 22d. The plague was on the decline in that city, the number of deaths being then little more than twenty per day. The amount of the mortality occasioned by the epidemic during the last six months was supposed to have been at least 120,000 in divid uals."

"This year has been remarkable for earthquakes; and at the foot of St. Plomb, at Brigne, in the Alps, there seems to be a permanent earthquake, for the movements began on the 22d of February, and have continued ever since, but have considerably diminished in intensity. The earthquake at Lisbon extended as far as Brigne, and caused great destruction there, which adds to the present alarm."

Morning Chronicle, Friday, September 1, 1837.

* "Strabo affirms that the earliest mines of Andalusia were produced from ores reduced to fluidity, in consequence of some countrymen having accidently set fire to the superincumbent woods, whereby

ally resolving itself into its primitive elements, coal or carbon, iron and water,* and to be increasing

the substance of the earth itself became heated, and the fluent metals ran into uniform masses; which were shortly afterwards discovered, when the same tract of country was shattered into distinct fragments by an earthquake. Aristotle asserts the same respecting the first traces of the silver mines of Spain."—*M. Good's Notes on Lucretius.*

* "Iron will preserve its solid form till it be heated to 130° of Wedgewood's scale. It will then become fluid, and by increasing the heat still further, it will disperse as gas." *Lydiard.*—"It has been calculated by an engineer of eminence, that every four-horse coach deposits twelve pounds of iron in every 100 miles of its journey: and that consequently, assuming the number of such coaches passing daily between London and Birmingham alone to be twenty, the *weight of iron* deposited during every transit, exceeds 250 lbs. These results, it is stated, are not conjectural, but derived from investigations applied to the horse-shoe and the tire of the wheel: in the first instance previously to use; and in the second, after the wear and tear of the road had rendered them useless. And they have been found, it is added, as to every ton weight of iron so tried, nearly uniform."—*Morning Chronicle, October 7th,* 1835.—I would ask the simple questions, what has become of the iron deposited? And does it now exist in the solid, fluid, or elastic form?

"If metallic matter were not poured in from above, nor ejected from below, in what manner did it come into the vein?" * * "Some of the metals and other substances found in veins, are capable of solution in *hydrogen gas*, and perhaps all of them may be so by natural processes; in this state they may have penetrated the vein and deposited their contents."—*Bakewell's Geology.*

A correspondent who resides near the Maesteg Iron Works, Margam, says—"The quantity of iron (pig) that has been exported from this place during the last year to the coast of France alone exceeds 7,000 tons; and large orders of castings, gas-pipes, &c., have been executed for different parts of England and Ireland. Orders are received daily, and trade seems to revive to its former state. The company have also found a very superior vein of bituminous coal, for which a very ready sale in the London and other markets has been obtained, and they intend shipping 150 tons daily."—*Cambrian,* 1833.

both internally and externally its powerful stream of combustion.

Heaps of coals lying in large masses at the mouth of every coal-pit near Bishop Auckland, I have myself seen in a constant state of inflammation, the light from their combustion only becoming visible at night.

> "Sure there is need of social intercourse,
> Benevolence, and peace, and mutual aid,
> Between the nations, in a world that seems
> To toll the death-bell of its own decease,
> And, by the voice of all its elements,
> To preach the general doom. When were the winds
> Let slip with such a warrant to destroy?
> When did the waves so haughtily o'erleap
> Their ancient barriers, deluging the dry?
> Fires from beneath,* and meteors from above,†
> Portentous, unexampled, unexplained,

"In a work lately published by a Spaniard, there is a comparison between the produce of the gold and silver mines in America and the coal-mines in England, from which it appears that the gross value of the annual produce of the coal mines is 18,000,000 tons, amounting to 450,000,000f., including the wages and other charges; whilst the produce of the gold and silver mines, including the same charges, is only 2,500,000f.; showing a balance in favour of the coal mines, and over the gold and silver mines of the New Works, of no less a sum than 229,500,000f."—*French Paper.*

* "From the Report Book, kept by the London Fire Establishment, it appears that the number of fires which have occurred in London within the last twelve months, is *six hundred and forty-two.*"—*Newspaper Paragraph.*

† "The Boston Herald, July 25, 1834, states that a very brilliant meteor in the heavens was observed at Stamford on Saturday night, between eleven and twelve o'clock, diffusing a light as powerful as

> Have kindled beacons in the skies; and th' old
> And crazy earth has had her shaking fits
> More frequent, and foregone her usual rest."
>
> *Cowper's Task.*

To what causes must we attribute all these multi-

the full moon with a clear sky. Its duration was about three seconds; and what is remarkable, it was raining fast at the time, though there was a break in the clouds at some distance off."

The Nottingham Review describes "a beautiful meteor seen at Kedleston, in the north-eastern hemisphere. It bore the appearance of a pillar of fire, of a very clear red colour, about twenty feet in length by three in diameter; it remained stationary for about three quarters of an hour, and then totally disappeared."

"A letter from Brun, in Moravia, gives an extraordinary account of a meteor, said to have been visible in that town. Just after nightfall, a very vivid streak of light was suddenly visible, the effect of which was to lead to the belief that many houses in the immediate vicinity were in flames. A continued noise was heard, and the heavens appeared to be completely on fire."

On another occasion "the town of Brussels was alarmed by the appearance of a brilliant red light in the north, which looked like the reflection of a very large fire at a distance; it, however, soon assumed the form of a dense illuminated cloud of vapour, of an intense vermilion colour, which separating into two distinct portions over the town of Brussels, one part went off in a direction to the W.N.W. and the other to the N.; the former, suddenly dividing itself again into long horizontal lines of electrial fire, at length disappeared. Accurate minutes of this phenomenon were taken by M. Quetelet, of Brussels, and by Dr. Forster, of Cambridge, who happened to be passing through Belgium at the time, and who determined the altitude of the phenomenon to be very considerable, and that it was not an ordinary Aurora Borealis."

The Edinburgh Observer mentioned that the heavy gales were preceded in October last by a series of the most brilliant Auroræ Boreales. "They were visible, night after night, in all the shapes of arches, pencilled rays, and dense masses, illuminating the northern hemisphere."

One of our journals, about the same period, described a singularly

plied phenomena, but to the work of man in turning to his own private account the properties of the substantial portion of our globe, to meet his cupidity? The constant use of steam, gas, and iron machinery, with the hot blast, are among the primary causes of the approaching catastrophe: and this monopolization of public property, in order to convert it into private luxuries, (which nature has herself interdicted,) increases the danger tenfold: witness the hundreds of accidents, too horrifying to relate, which have been the consequence of the application of steam power, and of the use of gas-lights. *Water*, that element designed for the benefit of man, has been perverted by him to his own private views, by him separated into its component parts, and thus enabled to add its powerful assistance to the general stream of combustion.* By the use of

interesting fiery meteor, which passed over the metropolis, "and must have been seen by hundreds of thousands in every direction, between the hours of eight and nine o'clock in the evening, it giving to the heavens the appearance of a near and fiercely spreading conflagration. This had the effect for nearly an hour of keeping almost all the firemen and engines of the metropolis in motion. Very nearly similar phenomena, and producing the same useless activity among the firemen and their horses, occurred on the night of the 17th of November last year, when twelve engines and seventy-four men were kept in activity from eleven o'clock P.M. till six the next morning, the causes of alarm successively reappearing. At the corners of the streets, both then and on the present occasion, groups were seen collected, conjecturing the locality of the conflagration, which all agreed was raging."

* The following extract from Mr. Monck Mason's highly interesting narrative of the æronautical expedition from London to Wielburg will illustrate the subject we are now contemplating:

gas-lights and iron railways in all parts of the globe,

"The night having now completely closed in, and no prospect of any assistance from the moon to facilitate our researches, it was only by means of the *lights, which either singly or in masses appeared spreading in every direction*, that we could hope to take any account of the nature of the country we were traversing, or form any opinion of the towns or villages which were continually becoming subjected to our view.

"The scene itself was one which exceeds description. The whole plane of the earth's surface, for many and many a league around, as far and farther than the eye distinctly could embrace, seemed absolutely teeming with the scattered fires of a watchful population, and exhibited a strong spectacle below, that almost rivalled in brilliancy the remoter lustre of the concave firmament above. Incessantly during the earlier portion of the night, ere the vigilant inhabitants had finally retired to rest, large sources of light, betokening the presence of some more extensive community, would appear just looming above the distant horizon in the direction in which we were advancing, bearing at first no faint resemblance to the effect produced by some vast conflagration, when seen from such a distance as to preclude the minute investigation of its details. By degrees, as we drew nigh, this confused mass of illumination would appear to increase in intensity, extending itself over a larger portion of the earth, and assuming a distincter form, and a more imposing appearance, until at length, having attained a position from whence we could more immediately direct our view, it would gradually resolve itself into its parts, and shooting out into streets, or spreading into squares, present us with the most perfect model of a town, diminished only in size according to the elevation from which we happened at the time to observe it.

"It would be very difficult, if not impossible, to convey to the minds of the uninitiated any adequate idea of the stupendous effect which such an exhibition, under all its concomitant peculiarities, was calculated to create. That we were, by such a mode of conveyance, amid the vast solitude of the skies, in the dead of night, unknown and unnoticed, secretly and silently reviewing kingdoms, exploring territories, and surveying cities, in such rapid succession as scarcely to afford time for criticism or conjecture, was in itself a consideration sufficient to give sublimity to far less interesting scenes than those which formed the subject of our present contemplations. If to this be added the uncertainty that from henceforward began to pervade the whole of our course, an uncertainty that every moment increased

man is literally organizing the exterior, or surface

as we proceeded deeper into the shades of night, and became further removed from those land-marks to which we might have referred in aid of our conjectures, clothing everything with the dark mantle of mystery, and leaving us in doubt more perplexing even than ignorance as to where we were, whither we were proceeding, and what were the objects which so much attracted our attention—some faint idea may be formed of the peculiarity of our situation, and of the impressions to which it naturally gave rise.

"In this manner, and under the influence of these sentiments, did we traverse, with rapid strides, a large and interesting portion of the European continent; embracing within our horizon an immense succession of towns and villages, whereof those which occurred during the earlier part of the night, the presence of their artificial illumination alone enabled us to distinguish.

"Among these latter, one in particular, both from its own superior attractions, the length of time it continued within our view, and the uninterrupted prospect which our position directly above it enabled us to command, captivated our attention and elicited constant expressions of mingled admiration and surprise. Situated in the centre of a district which actually appeared to blaze with the innumerable fires wherewith it was studded in every direction to the full extent of all our visible horizon, it seemed to offer in itself, and at one glance, an epitome of all those charms which we had been previously observing in detail. The perfect correctness with which every line of street was marked out by its particular line of fires; the forms and positions of the more important features of the city, the theatres and squares, the markets and public buildings, indicated by the presence of the larger and more irregular accumulation of lights, added to the faint murmur of a busy population still actively engaged in the pursuits of pleasure, or the avocations of gain, all together combined to form a picture, which, for singularity and effect, certainly could never have been before conceived. This was the city of Liege, remarkable from the extensive *iron works* which, abounding in its neighbourhood, occasioned the peculiar appearance already described, and at the time led to that conjecture, concerning its identity, the truth of which a subsequent enquiry enabled us to confirm.

"This was the last spectacle of the kind which we were destined to enjoy. Scarcely had we completely cleared the town and the fiery region in which it was embosomed, ere an unbroken obscurity, more

of the earth, with that substance intended to give solidity and strength to the internal fabric,* and thereby causing a double pressure on our atmosphere, with an increased attraction of the moon towards the earth, which must eventually be drawn from its present position, and a partial or general change *prematurely* take place throughout the whole universe.†

This subject is of no minor importance: it involves the fate of not only the habitable world, but the universe of which that world forms a part. I would here, therefore, offer a caution, and endeavour to awaken the mind of man to a most material point of observation, one to which he has not yet (as appears to me) given his attention: the destruction of this globe, our earth.

profound than any we had yet experienced, involved us in its folds, and effectually excluded every terrestrial object from our view."

* While, on the other hand, by mining and forming tunnels and shafts, man is aerating the internal portion: the gas-pipes and railroads may be considered as literally performing the office of arteries and veins on the surface of our planet. The former branch out in all directions, from a central point, (the gasometer,) whence they are supplied, and carry the material to an appointed distance, where ignition takes place. When a deficiency of matter arises at the primary or centre, darkness succeeds at this outward point of combustion: such was really the case upon the explosion which occurred, a short time since, at the South Metropolitan Gas Works, and in a more recent instance at Westminster.

† If fluid iron be disturbed in cooling, it will not have all the properties of *iron;* it will become *solid,* but will want all the natural texture of iron, its colour, and some of its strength. If water be stirred with a stick while freezing, it will not be *ice,* though it will become *solid.*

Let me seriously propose the following questions. If the earth is a living animal, as was believed by the ancients, and has been advanced by myself, may it not be brought to a premature death, or may not this earth become deranged and deformed, by drawing its internal moisture to the surface, and all its inhabitants suffer from the change? For if an inflammation be set going upon the surface of this earth, it must, from time to time, penetrate to the interior, causing convulsions of the most dreadful kind to take place, and destroying life by wholesale numbers.*

It does indeed appear to me, as a looker on, that man, by his continued excavation in mining and drawing the different metals from the bowels of the earth, is literally digging his own grave and that of his fellow-countrymen and inhabitants of this planet. This idea may be ridiculed, but it is not a wild theory: it is the conviction of a mind that

* A letter from Santiago di Chili, May 16, 1833, says—" A violent earthquake took place on the 25th of April, about half-past ten in the morning, at Huasco (or Juasco), a maritime town of the province of Coquimbo, and a place of some importance, in consequence of the *mines* in the neighbourhood. According to the reports received here, a large number of the houses had been thrown down, and the others left in a dangerous state. The church was considerably damaged; some later letters, indeed, state that a second shock had completely destroyed it. The reports which we have received up to this moment do not make mention of any loss of life, but it is difficult to suppose that in such a catastrophe none should have perished. It is supposed that this terrible phenomenon had been attended with not less serious con-

has devoted itself during the last thirty years to physiological observations on matter, motion, and

sequences at Copiapo, another town of the same province, situated about two degrees northward of Huasco, and which is also the *centre of great mining operations;* but we have no certain intelligence upon the subject, the courier who brings the news of the disaster at Huasco having been despatched two hours after its occurrence."

"The rapid destruction of the cliffs between Kemp Town and Rottingdean cannot but strike every one. The road to the latter place has been three times encroached upon and destroyed within the last twenty or thirty years; and although the present line is so far removed as to be apparently beyond the reach of injury, at least for many years, yet since the last road was made a very great loss of the cliffs has taken place, and their destruction is in active progress. This devastation is not occasioned, however, by the inroads of the sea, except in a trifling degree. The following is the real cause:—The ancient bed of shingle which rests upon the chalk, and which supports the mass of loose materials of which the upper part of the cliff is composed, consists of loose pebbles and large boulders, imbedded in a very fine sand. This bed is exposed near the base of the cliffs, and is consequently very accessible; and, as large flints are more readily obtained from it than from the modern beach, the men employed to collect these materials are daily picking it out and undermining the cliffs, which, from the want of support, fall down in enormous masses, and are washed away by the sea. It is a matter of surprise and regret that the lords of the manor allow this destruction to take place; for, admitting that the surface soil, which has been, and is still being, destroyed, be of no great value (although it must, within the last twenty years, have amounted to several hundred acres), yet ultimately the cliffs must approach the present road and the ground on which the gas-works and other buildings are situated. This destruction, we repeat, is not occasioned by the inroads of the sea; it is solely produced by the removal of the ancient shingle bed: and thus, for a few cartloads of flints, which could easily be obtained elsewhere, the cliffs to the extent of many hundred yards have been destroyed, and much valuable property endangered. It appears probable that the encroachments of the sea along the shores at the Marine-parade, which have occasioned the necessity of the enormously expensive works that are now being

man. "Behold, the *former things* are come to pass, and *new things* do I declare; before they spring forth I tell you of them." *Isaiah*, xlii., 9.

The gradual approach of this important change will be very visible to all. Truly has the poet said,

> "The morrow
> That o'erlooks thy twilight, Earth,
> Is one of shade and sorrow!"

The earth's atmosphere is becoming progressively condensed and changed, impeding the descent of the fluid essential to life. Lightning, thunder, heavy rain, and tempests,* are increasing from year to year

carried on for its protection, have been greatly accelerated by a similar reckless removal of the foundation of the cliff. Within the last fortnight several cartloads of shingle have been taken away from the ancient bed beyond Kemp Town; and this has occasioned the fall of many hundred tons of the cliffs!"—*Brighton Gazette*, 1834.

"We understand that the money paid to the poor of this parish last winter for digging flints was 1,978*l.*; and that the flints sold for 246*l.*"—*Ibid. May*, 1834.

* *Thunder Storm.*—"We, and probably all Britain, have just been visited by a thunder storm of the old description. Tuesday morning exhibited an eastern harr of a very dense character. The double flashes of vivid lurid lightning struggled through every crevice; no window-shutter or curtains were proof against its penetrating glare. One flash, in particular, was immediately followed by a peal so loud and astounding that most people sprung instinctively to their feet, and some rushed into each other's arms. Every house shook to the foundation. It was, indeed, fearfully and awfully sublime. A strong wind has now succeeded to this seemingly general storm, and a copious fall of rain is refreshing the green and rejoicing fields around us. We have not heard of any accident."—*Edinburgh Courant, June* 1830.

"On Thursday night last the eastern part of Kent was visited by an alarming appearance of the atmosphere: in almost every part the

by the vital fluid being thus arrested in its progress to us: these rains and tempests occasioning devastation, disease, and death. For, as our atmosphere becomes more condensed, the parasitical races of animals will, on the contrary, increase, not only in the solid, but in the fluid and the aeriform state,

electric fluid illuminated the heavens, and often presented them in one blaze. From eleven to twelve o'clock the scene was terrific. From all the accounts that have reached us, it appears the heaviness of the storm was most severely felt at Margate, the effects of which it is almost impossible to describe. Hail, rain, thunder, and lightning, descended in quick succession: the largest hail-stones seen within the recollection of man covered the ground. The damage done is estimated to exceed 1,000*l.*"—*Kent and Essex Mercury, July* 18, 1832.

"The effects of the storm on Thursday night at Margate were of a nature almost unprecedented in this country. Even those who were well acquainted with tropical climates, allowed that they had seldom seen one in which the hail was more destructive. Not less than 15,000 panes of glass are computed to have been destroyed by it in that town, while in the nearly adjoining village of Birchington no injury whatever was done. In the new church 100 panes were broken. Scarcely one pane escaped in the front of the Ship Inn. The sky-light in the roof of the Hoy Inn having been broken in, the rain ran through the house in an impetuous torrent. In very many houses the inhabitants sat up all night."—*Kentish Gazette, July* 19, 1832.

Alarming Thunder-Storm.—"On Saturday last there was a most tremendous thunder storm in the south-east part of this country, accompanied with the most destructive hail-shower ever witnessed by the oldest inhabitants. The clouds collected on the mountains near Draperstown, and fell out on a long range of country, passing over Tobermore. It crossed the Mayola river, and then taking a course between Maghera and Macloghrim-hill, conveyed destruction where-ever it went. The crops have been very much injured, particularly oats, and the late potatoes. Some of the hail-stones were two inches and a half in circumference, and in some places they were found twenty-four hours after in an unmelted state. They were of various

and commit greater depredations on the ascending creation; thus withdrawing by degrees from man his supply of nutriment.* If, therefore, mechanism be not limited or entirely stopped, our earth's atmosphere will eventually become so condensed as to be unfit for its present race of inhabitants. Mankind will degenerate in height, in width, and strength; till by the increased pressure, he will, with all the ascending creation, become reduced to the primitive stature.

shapes, and as hard as solid ice. Many windows were broken by them, and small wild birds were in many places found lying dead."—*Derry Sentinel, August* 24, 1832.

A Terrible Storm.—"We have been favoured by a gentleman of Lenton, near this town, (says the *Nottingham Mercury*, October 11, 1834,) with the following extract of a letter received from Colonel S. Stretton, who is on a tour in Italy, dated Battaglia, near Padua, August 29: "We have just had a most dreadful storm, which fell upon the city of Padua, about six miles off; the masses of ice which fell were about 20lb. weight, and three feet in circumference; they broke in all the roofs of the houses in that half of the city in which they fell, (only one-half was visited,) demolished the large marble statues, windows, &c., and beat the lead on the roof of the cathedral into large holes, as if with heavy hammers. About 3,000,000*l.* would be required in England to replace tbe damage done to the houses now in ruins. I was looking at the storm in this place, where although, thank God, no masses of ice fell, yet we had torrents of rain and dreadful thunder."

The fearful thunder-storm which occurred during this last summer, must be still fresh in the recollection of the reader.

* "The number of distinct species of insects already known and described cannot be estimated at less than 100,000; and every day has added to the catalogue.

"Four-fifths of the insects, at present known, have been discovered within the last ninety years; for, in 1743, Ray estimated the total number of species at 20,000 only. See his work on "the Wisdom of

Fevers, mania, and consumption will multiply in

God as manifested in the Creation. (P. 24.)"—*Dr. Roget's Animal and Vegetable Physiology.*

"In botany, when the species known in the time of Linnæus were about 10,000, they are now about 100,000."—*Prof. Whewell.*

Singular Phenomenon.—"Early last Monday morning this city was visited by myriads of a small sort of fly, larger than the midge, but much smaller than the common house-fly, and having very long wings. The air was filled with them, and they settled by hundreds upon the persons of those who were abroad at the time. We learn by the *Lincolnshire Chronicle* that a similar phenomenon was observed at Spalding, on Sunday week; and that the annoyance occasioned by these insects was sufficient to remind one of the plagues of Egypt."—*York Herald, October*, 1834.

"Some tracts of the province of Murcia, in Spain, are at this moment suffering from a destructive insect, called Paulina. It is a white fly, with black stripes on its wings and back, similar to a bug, but of a larger size. These insects have come in such swarms that, like the locusts in Egypt, they sometimes darken the sun. They alight on a field of ripe corn, where they remain twenty-four hours, leaving on the ear an infectious matter, which immediately dries up the stalk, and changes the grain into a paste similar to starch. It is said that if the corn were used for bread, it would prove mortal. Fortunately, nature seems to have denied to this destructive insect the instinct of self-preservation. It suffers itself to be approached and caught. It only alights on wheat, Indian corn, and rye, and disdains all other corn. The country people, encouraged by the authorities, collect these insects with as much care as olives. They are put into bags and afterwards destroyed. The corn-fields are then set on fire in the presence of soldiers sent by the authorities, in order to prevent the inhabitants gathering the dangerous produce."—*Galignani's Messenger, July* 15, 1833.

"The *Zara Gazette* announces that in Hungary millions of beetles are devouring the crops and the foliage. To destroy them, smoke and other means have been resorted to, but without success, as these experiments appear rather to make them come out of the ground than to exterminate them." *July*, 1834.

Taint in the Potato Crop.—"We are sorry to learn from various

a frightful degree; plagues, pestilence, and famine:

quarters that taint in the potato crop, a new disease in the South of Scotland, is becoming pretty general. Three years ago the potato-seed failed in certain fields in the neighbourhood of Whithorn, greatly to the injury of poor persons; and in 1831, if our memory serves us right, the same thing occurred in the neighbourhood of Kirkcudbright. This year the evil, increased at Whithorn, has reached the Borough-roads of Wigtown, and other parts of the shire; and not a few fields have been ploughed down and sown with turnip, from the extraordinary scantiness of the potato braird. In Annandale and Nithsdale complaints are made to the same effect. In a field situate very near this town, the seed germinated at one end of the rows and rotted at the other, from causes which no one can satisfactorily explain. In the parish of Kier, where the seed in one field was examined the moment danger was apprehended, portions of it were found filled with worms: and in other instances one-half of the cuts were found soft, and the other nearly as hard as marble."—*Glasgow Chronicle.*

"Considerable interest has been lately excited amongst persons residing on the banks of the Thames by the vast numbers of fish, in a diseased state, consisting of roach, dace, barbel, &c., taking shelter under the banks and in the shallow water. Some, on examination, have been found to be covered with a kind of fur, with a small species of leech adhering to them; others have been eaten almost in two by some disease. The present unhealthy season appears to have affected even the finny tribe; the oldest fishermen cannot recollect a season of so much mortality amongst fish. They ascribe it to the long-continued cold weather, especially at the time of spawning, when the fish are weak and unable to bear the cold."

Extraordinary Phenomenon.—"Yesterday evening Mr. J. Parker, Mr. J. Rogers, Mr. A. Scott, and several other persons, being at Three-mile house, observed something in the air, which they at first took to be mist or fog, but, as the evening was clear, they were induced to take more notice of it, and by holding their hands above their eyes, so as to exclude the rays of the sun, they could distinctly see the bodies of insects, apparently of a red or crimson colour. They were in sheets, with trains after them resembling that of a comet; each sheet of these insects appeared by itself, and they were moving in a direction from west to east, about twenty-five or thirty feet from the earth, and at least twenty yards in width, following each other in

monsters will arise and overflow this land of plenty:* the sun will be obscured, and the night turned into day.† Finally, man and all the present races of animals will become extinct, not a trace or remnant left.

Our planet is approaching nearer to the sun every year, by the contraction or condensation of their mutual atmospheres: these are gradually condensing into charcoal, and as we come nearer to his body,

flocks like the pigeons; they observed the passage of these insects for more than twenty minutes, the sun at the time being more than one hour high."—*Halifax Scotian, October*, 1834.

* "Frogs, in passing from the egg to maturity, go through an *intermediate* state, in which they are called tadpoles. They then not only have *no limbs*, and possess a *tail*, but, like fishes, live in water, and breathe by means of gills instead of lungs. Dr. Edwards took a considerable number of frogs in this state, and dividing them into two portions, placed them under water in perfectly similar circumstances, except that the one portion was exposed to light, and the other was excluded from it. This difference had the very remarkable effect of retarding the transformation of the latter to the state of perfect frogs. Whilst the tadpoles in the light had undergone this change, several of those in the dark retained their original form, but had greatly *increased in size.* The effect of the absence of light appears likewise to be shown in the colour and structure of the proteus, and some other animals, which inhabit situations into which light never enters." *Saturday Magazine.*

† When the disciples enquired of our Lord, "What shall be the sign of thy coming, and of the end of the world?" they were told that "famines, pestilences, and earthquakes" would be the "beginning of sorrows" at that time. *Matthew*, xxiv. 7, 8." And that "then shall be great tribulation, such as was not since the beginning of the world to this time, no, nor ever shall be:" ver. 21. And "immediately *after* the tribulation of those days shall the sun be darkened, and the moon shall not give her light, and the stars shall fall from heaven, and the powers of the heavens shall be shaken, &c.:" ver. 29.

they will grow more cloudy, until he is quite obscured.

" I had a dream which was not all a dream.
The bright sun was extinguish'd, and the stars
Did wander darkling in the eternal space,
Rayless and pathless, and the icy earth
Swung blind and *blackening* in the moonless air;
Morn came, and went,—and came, and brought no day,
And men forgot their passions in the dread
Of this their desolation; and all hearts
Were chill'd into a selfish prayer for light:
And they did live by watchfires—and the thrones,
The palaces of crowned kings—the huts,
The habitations of all things which dwell,
Were burnt for beacons; cities were consumed,
And men were gathered round their blazing homes
To look once more into each other's face;
Happy were those who dwelt within the eye
Of the volcanos, and their mountain torch;
A fearful hope was all the world contain'd;
Forests were set on fire—but hour by hour
They fell and faded—and the crackling trunks
Extinguish'd with a crash—and all was black.
The brows of men by the despairing light
Wore an unearthly aspect,* as by fits
The flashes fell; some lay down
And hid their eyes and wept; and some did rest
Their chins upon their clenched hands, and smiled;
And others hurried to and fro, and fed
Their funeral piles with fuel, and looked up

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* "Their visage is blacker than a coal; they are not known in the streets: their skin cleaveth to their bones; it is withered, it is become like a stick."—*Lam. Jeremiah*, iv. 8.

" And above shall they look, and to the earth cast their eyes,
And behold! horror and black tempest,
Gloom heap'd together, and conglomerated darkness."
Isaiah, chap. viii. 22. *Translated from the Hebrew by M. Good.*

With mad disquietude on the dull sky
The pall of a past world ;*
* * * *
All earth was but one thought, and that was *death*,
Immediate and inglorious.
* * * * *
* * * The world was void,
The populace and the powerful was a lump,
Seasonless, herbless, treeless, manless, lifeless—
A lump of death—a chaos of hard clay.
The rivers, lakes, and ocean, all stood still,
And nothing stirred within their silent depths;
Ships sailorless lay rotting on the sea,
And their masts fell down piecemeal; as they dropp'd
They slept on the abyss without a surge—
The waves were dead; the tides were in their grave,
The moon their mistress had expired before;
The winds were withered in the stagnant air,
And the clouds perish'd; Darkness had no need
Of aid from them—She was the Universe."

Darkness. Lord Byron.

It must indeed be evident to every observing mind, that the earth is fast approaching its third or aerial stage of existence. There is a definite period affixed for its change, and like all changes of matter, it will be wrought by the power of gravitation or pressure.

The earth's atmosphere, which grows with its

* "A pall of darkness veils
The land of Palestine;—a stilly gloom,
More dreadful than the deepest night. The hills
Grow dim; the rivers roll, as if in wrath!
And men, with quailing limbs and dropping lips,
Come forth, and stare, tongue-tied, upon the skies!"

growth, is daily becoming more and more affected by the internal convulsions of its body, and the condensation of this third form of matter will produce the aeriform existence of our planet. A decrease of longevity has already taken place; disease and death have, during the last few years, been making unusual ravages: consequently, a larger supply has been afforded for the organization of both earth and moon. These, I repeat, are not two bodies, but belong to each other, being connected by their medium or atmosphere; compression of either portion being felt at the other part, or extreme, of the body. The moon is said to be approaching the earth, and this is really the case. By their mutual increase of size they are rapidly condensing the fluid medium in which they float: they are even now approximating to each other, and, by the increasing condensation of the connecting fluid, will be brought nearer and nearer, till they finally become incorporated.* The atmosphere, oxygen, or iron, by enclosing the boiling liquid elementary

* "The oblique muscles attached to the head, are so disposed, as to be capable of steadying the globe, as well as of moving it. The head of a new born infant is often obliged to be filleted up. After death, the head drops and rolls in every direction. So that it is by the equilibre of the muscles, by the aid of a considerable and equipollent muscular force in constant exertion, that the head maintains its erect posture."—*Paley's Natural Theology.*

diamond, preserves it through the change:* this crystalline case, at the surface of our atmosphere, gradually extending itself over the whole machine, will envelope all the antecedent surface within its grasp,† becoming at last so dense as to produce

* Dr. Herschell, in giving an account of three spots or volcanic eruptions he observed in the moon, says, "the appearance of what I have called the actual fire, or eruption of a volcano, exactly resembled a small piece of *burning charcoal when it is covered by a very thin coat of white ashes*, which frequently adheres to it after it has been some time *ignited;* and it had a degree of *brightness*, about as strong as that with which such a coal would be seen to glow in faint daylight. All the adjacent parts of the volcanic mountain seemed to be faintly illuminated by the eruption, and were gradually more obscure as they lay at a distance from the crater."

† "The air-vessel at the broad end of an incubated egg gradually extends its edges along the sides of the shell, as the egg enlarges, but is at the same time applied closer to the internal surface of the shell: when the time of hatching approaches, the chick is liable to break this air-bag with its beak, and thence begin to breathe and to chirp: at this time, the edges of the enlarged air-bag extend so as to cover internally one hemisphere of the egg; and as one-half of the external shell is thus moist, and the other half dry, as soon as the mother, hearing the chick chirp, or the chick itself wanting respirable air strikes the egg, about its equatorial line, it breaks into two hemispheres, and liberates the prisoner."—*Dr. Darwin.*

Mr. Monck Mason proceeds, as follows, with the Narrative of the Balloon Voyage to Wielburg:—

"It was now past midnight, and the world and its inhabitants had finally committed themselves to repose. Every light was extinguished and every sound hushed into silence; even the dreadful note of the vigilant watch-dog, which had frequently contributed to enliven our course during the previous portion of the night, had now ceased; and darkness and tranquillity reigned paramount over the whole adjacent surface of the globe.

"From this period of our voyage, until the dawning of the following

a completely electrical combustion or universal conflagration, thus bringing about the change of the planet to the third or aeriform state, which will

day, the record of our adventures becomes tinged with the obscurity of night. The face of nature completely excluded from our view, except when circumstances occasionally brought us into nearer contact with the earth, all our observations during the above period are necessarily confined to a register of incidents and sensations mingled with vague conjectures, and clouded with the mystery wherewith darkness and uncertainty were destined to involve so large a portion of the remainder of our expedition. The moon, to which we might have looked up for companionship and assistance, had she been present, was nowhere to be seen. The sky, at all times darker when viewed from an elevation than it appears to those inhabiting the lower regions of the earth, seemed almost black with the intensity of night; while, by contrast no doubt, and the remotion of intervening vapours, the stars, redoubled in their lustre, shone like sparks of the whitest silver scattered upon the jetty dome around us. Occasionally faint flashes of lightning, proceeding chiefly from the northern hemisphere, would for an instant illuminate the horizon, and after disclosing a transient prospect of the adjacent country, suddenly subside, leaving us involved in more than our original obscurity. Nothing in fact could exceed the density of night which prevailed during this particular period of the voyage. Not a single object of terrestrial nature could anywhere be distinguished; an unfathomable abyss of "darkness visible" seemed to encompass us on every side; and, as we looked forward into its black obscurity in the direction in which we were proceeding, we could scarcely avoid the impression that we were clearing our way through an interminable mass of black marble in which we were imbedded, and which, solid a few inches before us, seemed to soften as we approached, in order to admit us still farther into the precincts of its cold and dusky enclosure. Even the lights which at times we lowered from the car, instead of dispelling, only tended to augment the intensity of the surrounding darkness, and as they descended deeper into its frozen bosom, appeared absolutely to melt their way onward by means of the heat which they generated in their course.

"The cold, during this part of the night especially, was certainly

be produced, in this instance, not by water, as was the former, or fœtal life, but by the more powerful agency of *fire*.*

We learn from Mrs. Somerville, that "water boils

intense, as could be perceived not less from the indications of the thermometer, (ranging variously from within a few degrees below, to the point of congelation,) than from the effects which it produced upon the different liquors wherewith we were provided. The water, coffee, and, of course, the oil in our several vessels, were completely frozen; and it was only by the actual application of the heat of the lamp that we were enabled to procure a sufficiency of the latter to supply our wants, during the long term of darkness to which we were about to be subjected.

"We appeared to be traversing large tracts of country partially covered with snow, diversified with forests, and intersected occasionally with rivers, of which the Meuse, in the earlier part of the night, and the Rhine, towards the conclusion, formed, as we afterwards learned, the principal objects, both of our admiration and of our conjectures.

"Large masses of fleecy clouds would at times likewise occupy the lower regions of the atmosphere, intercepting our view as we descended, and for a while leaving us in doubt whether they were not a continuation of those snowy districts which we so frequently had occasion to remark.

"From out of this mass of vapours, more than once during the night our ears became assailed with sounds bearing so strong a resemblance to the rushing of waters in enormous volumes, or the beating of waves upon some extensive line of coast, that it required all our powers of reasoning, aided by the certain knowledge we had of the direction we were pursuing, to remove the conviction that we were approaching the precincts of the sea, and transported by the winds, were either thrown back upon the shores of the German ocean, or about to enter upon the remoter limits of the Baltic."

* "According to the tradition of the Greeks, the world has been twice menaced with universal ruin: once by fire, and once by water."

M. Good.

Speaking of the celestial bodies, Cicero (in his work *Of the Nature*

at different temperatures under different degrees of pressure. There is no limit to the temperature to which water might be raised; it might even be made red hot, could a vessel be found strong enough to resist the pressure. The expansive force of steam is in proportion to the temperature at which the water boils; it may therefore be increased to a degree that is only limited by our inability to restrain it, and is the greatest power that has been made subservient to the wants of man."* "The expansion of steam is indefinite; the smallest

of the Gods,) says, "from hence we stoics conclude, which Panetius is said to have doubted of, that the whole world at last would be in a general conflagration; when, all moisture being exhausted, neither the earth could have any nourishment, nor the air return again, since water, of which it is formed, would then be all consumed; so that only fire would subsist, and from this fire, which is an animating power and a deity, a new world would arise and be re-established in the same beauty."

"And as it was in the days of Noe, so shall it be also in the days of the Son of man. They did eat, they drank, they married wives, they were given in marriage, until the day that Noe entered into the ark, and the flood came and destroyed them all. Likewise also as it was in the days of Lot; they did eat, they drank, they bought, they sold, they planted, they builded; but the same day that Lot went out of Sodom, it rained fire and brimstone from heaven, and destroyed them all. Even thus shall it be in the day when the Son of Man is revealed."—*Luke*, xvii. 26, 30.

* "Strange that there should slumber in yonder tranquil pond a power so tremendous that, could we condense and direct its energies, it might cleave the solid earth in twain, and yet so gentle that it may be governed, and applied, and set to perform its stupendous miracles by a child. This discovery that water would resist being boiled above 212 degrees, has conferred upon England, and its manufactures, a supre-

quantity of water, when reduced to the form of vapour, will occupy many millions of cubic feet." This earth may be considered a self-generator of steam, and it is not difficult to conceive the effect of restraint upon the vast mass of heated vapour contained within its body. Such compression must undoubtedly force the planet to ascend into a new sphere, and enter upon the aeriform or locomotive period of its existence.*

That matter, as exhibited on the surface of our

macy, and will eventually produce changes, both moral and physical, of which it is difficult to limit the extent.

"One bushel of coals properly consumed, will raise seventy millions of pounds a foot high.

"The Menai bridge, weighing four millions of pounds, suspended at a medium height of 120 feet, might have been raised where it is by seven bushels of coals. M. Dupin estimates the steam engines of England to possess a moving power equivalent to that of 6,400,000 men at the windlass. And this stupendous agent is at present only in its infancy."

* "On Saturday morning last, about seven o'clock, the neighbourhood of Upper Easton, near this city, was thrown into great alarm by the sudden explosion of a large steam-engine boiler, on the premises of Messrs. Bayly and Co., lead smelters. The effect was most terrific, and showed the immense power of steam. The boiler, which was nearly twelve feet high and thirty-five feet in circumference, and which weighed between three and four tons, was literally carried through the roof of the building, over an adjoining workshop, into a field thirty yards distant, tearing down a stack of chimneys in its way. As it ascended it could only be likened to an immense balloon rushing through the air. The shower of rafters, bricks, tiles, and stones, which accompanied the explosion, was truly awful; the road and fields close to the works were covered with the fallen fragments; and a large broad-wheel waggon, loaded with small coal, the whole weighing four tons, was thrown several yards and up-

earth, exists in a state of bondage, must be evident upon the most casual observation. The animal productions of the fœtal body are chained to its surface by an iron bond, but, when the aeriform or locomotive life of the planet commences, these, being purified by combustion, will be restored to their natural form and kind, resuming their existence in a more exalted sphere. Having

set, the near hind-wheel being struck off at the axle-tree. We are sorry to say that six persons, including the engineer, who was supposed to have been feeding the fire at the time, were dreadfully scalded, and taken to the Infirmary; three of the sufferers have since died, one of whom was a boy, who was unfortunately in the ash-pit immediately under the boiler at the time the explosion took place; he was much scalded, and buried beneath the ruins; the other three are still in great danger. An inquest has been held upon the bodies of the three unfortunate victims, when the Jury returned a verdict of "Accidental Death, caused by the *indiscretion of the engineer is placing too much weight on the safety valve*."—*Bristol Gazette.*

"That a gradual increase of *pressure* can produce all the effects of the most violent explosions, may be inferred from many cases on record, attributed with probability to this cause; and was proved conclusively by the direct experiments of this committee. (*Committee of the Franklin Institute.*) In these latter, cylinders of copper and iron were violently torn asunder, and the parts thrown from their places, scattering the materials of the temporary furnaces over which they had been heated, and of the fire, to considerable distances.

"This effect is well illustrated by the rendering of a copper cylinder just referred to. The subjoined figure and extract are from the first part of the Report of the Committee on Explosions, &c. p. 68. (*Journ. Franklin Institute*, vol. xvii. pp. 224, 225.)

"As before, nothing remarkable occurred previous to the instant of explosion, and the members of the committee, employed in the experiments, were engaged in observing the boiler at the instant it exploded. A dense cloud of smoke and flame, capped by steam, rose from the pit; the stones and combustibles were widely scattered, and the boiler was thrown, in a single mass, about fifteen feet from the

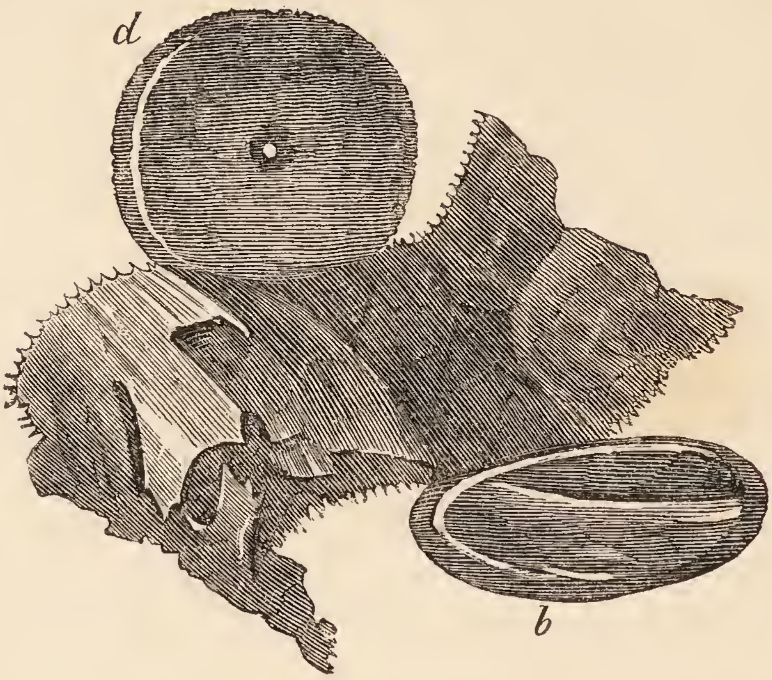
undergone decomposition or death, the seeds of the future race of beings will be accumulated by attraction into one complete body of perfectly elastic purity, and in this manner be preserved to their ultimate destiny.

There can be no doubt but that the labour of aeronauts will succeed, if persevered in; for

> "Man's heart th' Almighty to the future sets,
> By secret and inviolable springs."

The human mind, by this time, will comprehend,

furnace. The noise attending the explosion, was like that from the firing of an eight-inch mortar.



"The boiler was rent, as shown in the accompanying figure, giving way in an irregular line, just *above* the probable water-line on one side of the boiler, but not conforming to it. *d* and *b* were the lowest points in the two heads before the explosion. The sheet of copper was torn from the heads, unrolled and irregularly bent, adhering to the heads for only a short distance near the top of each, and the heads were bent *outwards.* The thickness of the copper along the line of rupture, varies from 0.25 to 0.35 of an inch, and the metal appears to have been highly heated at *one end of the torn portion.*"—*Mechanic's Magazine, December* 24, 1836.

from the perusal of the preceding pages, how a remnant of the virtuous portion of mankind may be saved alive in the last day by the very powerful invention of balloons. Ere the awful termination of the present abode of man, let us hope we may see the surrounding atmosphere spotted and illumined by moving vessels of every description, as we now behold them on the waters. Here then is excitement for genius and talent to unite in every possible way: not a moment should be lost in devising the means of preservation from the impending danger.

"Awake!
Thou, who shalt wake, when the creation sleeps;
When, like a taper, all these suns expire;
When time, like him of Gaza* in his wrath,
Plucking the pillars that support the world,
In nature's ample ruins lies entomb'd;
And midnight, universal midnight, reigns." *Young.*

* Samson. Judges, xvi., 29, 30.

CHAPTER VIII.

THE FŒTUS OF THE UNIVERSE.

(*Continued from page* 61.)

"Where ends this mighty building? Where begin
The suburbs of creation? Where the wall
Whose battlements look o'er into the vale
Of non-existence, Nothing's strange abode?
Say, at what point of space Jehovah dropp'd
His slacken'd line, and laid his balance by?
Weigh'd worlds, and measured infinite no more?
Where rears his terminating pillar high,
Its extra-mundane head; and says, to gods,
In characters illustrious as the Sun,
I stand, the plan's proud period; I pronounce
The work accomplish'd, the creation closed!"

YOUNG.

THE Universal Fœtus has been formerly described to be divided into three states of matter united in one: a solid centre or heart (which is our sun); the fluid medium around that heart, containing the several organs of the fœtal body; and an elastic boundary or skin, which encloses the two former. I shall resume the subject, at that point where I then found it necessary to break off, viz. the last of these three divisions—the Zodiac, or solar boundary.

The Zodiac is composed of the scum or refuse of the sun's matter; these impure materials are rejected from the centre and repelled to the surface of its sphere, there to become condensed by loss of heat, and to pass through every gradation in the scale of descending organization, until they are finally re-united at the apex, and returned inwardly in a new and improved form, through all the ascending degrees of life, to the heart, whence they were, in the first instance, ejected.

The earth we inhabit has been shown to be an epitome of the more extended universe, being, like it, divided into three distinct forms of matter:* it is the outermost of these which I am now describing, and whatever we have found to be true of the condition of matter on the surface of our planet, may be applied, on a larger scale, to the present subject. The universal boundary, like that of the earth, consists of a series of spheres; each sphere being composed of the solid, fluid, and aeriform states of matter, united by its peculiar line of gravitation, by means of which it is enabled to support

* "In the process of hatching an egg, the germinal membrane, as it is called, or rudimental part of the chick, is observed to become separated into three layers, from the external of which are formed subsequently the osseous and muscular systems, and the brain, spinal cord, and nerves; while, from the middle and internal layers, are formed respectively the heart and blood-vessels, and the intestinal canal and its appendages."

Bushman's Introduction to the Study of Nature.

its individual existence. Let the reader imagine the solar or universal sphere, (see diagram 1,) contracted and placed within the body of our planet (B), pole to pole: lines drawn, under these circumstances, from the surface of the earth (B, diagram 2,) to the constellations or stars within (C), would describe the several gravitating points of the animal boundary of the earth (A, D): the surface of the earth we inhabit being analogous to the upper portion (D) of those spheres, the lower part of which (A) we nightly view in the widely-spread canopy of the heavens. (See further explanation below the diagrams.) There islands and continents are progressively forming, each of these having its fluid medium and aeriform animal boundary, by which it is connected with its adjoining sphere and the whole universal membrane, or web of life. Who shall then deny the existence of celestial seas, White, Black, and Red? or hesitate to believe that the animals the ancients have represented to be the inhabitants of that exalted region, really do exist there in forms typified on a minute scale at our planet? The celestial Dog, the Bear, &c. must no longer be considered mere fables of the imagination.

The solar boundary is one continued series of parasitical life; the animal, vegetable, and mineral kingdoms being there fully developed, each deriving its constant supply of nourishment from the internal fabric—the universe. Man himself there

Diagram 1.

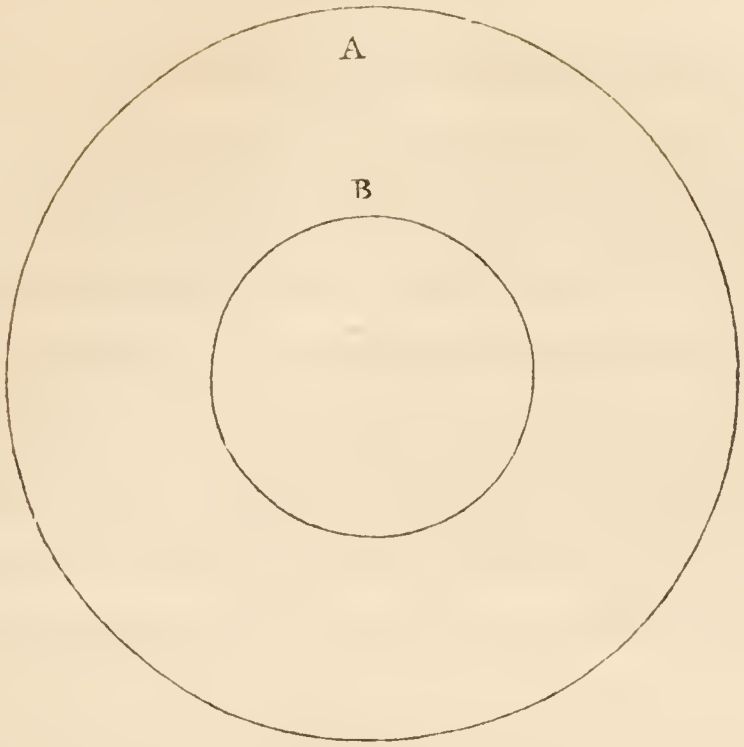
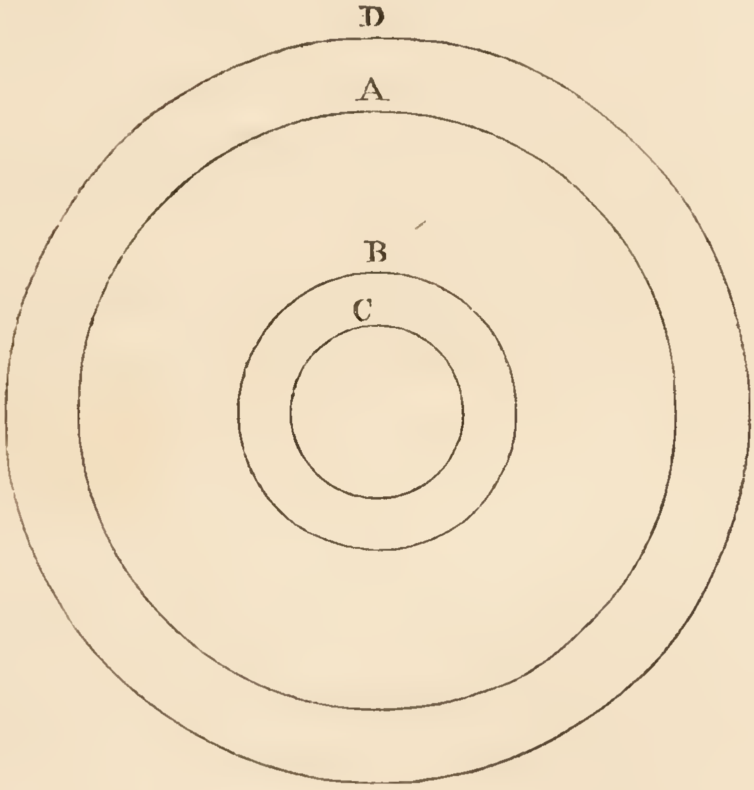


Diagram 2.



A, (Diagram 1,) represents the base of the zodiac or solar atmosphere, being the extent of the sun's sphere. B is the earth's surface, (the planet being placed for convenience in the centre.) A, (Diagram 2,) represents the base of the zodiac as before, B being also the surface of the earth as given in Diagram 1. C is an imaginary contraction of the circle A, and shows the real gravitating points of the earth's surface (B.) D is an imaginary extension of the earth's surface, (B) showing the actual surface of the zodiac or solar boundary. The earth being a true miniature of the more extended universe.

exists, his size and powers proportioned to the enlarged region he inhabits: he is the centre of each individual sphere, being surrounded by the works of his own hands, and progressing like the terrestrial man in knowledge and mechanism to a certain limit: the foundation or base on which he moves has been deposited by the decay of his predecessors, all being alike subject to the powerful law of gravitation.* By the decomposition of one

* "That the heathens thought the rise of a new star, or the appearance of a comet, portended the birth of a great person, has been proved by *Origen, (contra Celsum, lib.* 1.) Farther, it appears from Virgil, that it was commonly imagined the gods sent stars to point out the way to their favourites in difficult and perplexed cases; and that the ancients called globes of fire appearing in the air, stars.

"Subitoque fragore
Intonuit lævum, et de cœlo lapsa per umbras
Stella facem ducens multâ cum luce cucurrit." *Æn.* ii. 692.

Burder.

The Scriptures inform us that a new star really did appear in the east, at the birth of our Saviour. Thus the wise men, who came from the east to Jerusalem, (*Matthew* ii. 1, 2,) enquired, "Where is he that is born King of the Jews? For *we have seen his star in the east*, and are come to worship him." And when they departed thence to go to Bethlehem, "the star which they saw in the east, went before them, till it came and stood over where the young child was." (*Matthew*, ii. 9.)

"The ancients had an opinion, says *Shuckford*, (Connection, vol. 2, b. 8, p. 282,) that their great men and heroes at their death migrated into some star; and in consequence of that they deified them. Thus Julius Cæsar was canonized, because of a star that appeared at his death, into which they supposed he was gone. Vide *Sueton. Jul.* cap. 88. *Virg.* Ecl. ix. 47. Horace, lib. i. Od. 12."—*Burder's Oriental Customs.*

race of animals is always erected a new and improved species; and thus is the progression of animal machinery carried on: for all matter is of animal origin, and life one continued state of combustion, progressing from the most minute animal up to a certain definite size.

All animal bodies contain within themselves the principles of both heat and light. Heat is the quality of the pure diamond, light that of the pure iron:*

There is no doubt that the decomposition of matter at the surface of the solar sphere produces these respective luminaries.

"According to a curious memorial published by Professor Olmsted, it appears that a meteoric cloud of numerous flitting stars circulates round the sun like a planet, and comes very near the earth at that point of its orbit which corresponds with November. The central point of this mass of luminous bodies is fixed by the American astronomers in the constellation of Leo."—*Galignani's Messenger.*—See the notes to pages 60 and 61 of this work.

* "Heat is always from the hydrogen."—*Professor Brande.*

"Mr. Scheele says heat is a mixture of oxygen with phlogiston It appears he meant hydrogen."

"Oxygen gas," said Lavoisier, "seems to be a *compound* of the matter of *heat*, and a *basis*. In the act of burning, this basis is united to the combustible body, and the heat is evolved."—*Davy.*

"An illuminated gas is said to have been discovered at Birmingham, superior to all others, and obtained from *water.*"

In a very interesting lecture delivered by Mr. Bachhoffner, at the Artist's Society, in Clipston Street, Fitzroy Square, that gentleman described "the nature of the light produced from the combustion of the oxygen and hydrogen gases, their greatest effect being produced when united in the exact proportion in which they enter into the composition of water; namely, one part of oxygen to two of hydrogen in bulk; or eight of oxygen to one of hydrogen in weight. The light produced from this combination of gases is free to an almost perfect degree from the objections just named in relation to the ordi-

these can never be entirely separated; where the diamond or heat exists in an active state, the light or iron is latent or inactive; and, vice versâ, where the heat is latent, the light abounds.*

nary lights now in use; its rays are white, or nearly so, and therefore present the object to the eye of the beholder under an appearance in every respect similar to that which it bears in the daytime; the heat produced, though very intense at the actual point of combustion, is barely sensible at the distance of a few inches from the light, and no 'emancipated blacks' or unconsumed carbon is let loose to defile the fair texture of neighbouring objects. With such advantages to recommend this light, it may appear somewhat extraordinary that it has not yet been adopted for more general use;—the only obstacle hitherto in the way of its employment has been the danger which exists in mixing these two gases, hydrogen and oxygen, in any considerable quantities for consumption, as, so mixed, they immediately explode, and that with tremendous force, when presented to a burning substance."

* "One element appears where the electricity enters, the other where it goes out. Thus hydrogen is evolved where the electricity goes out, oxygen where it enters."—*Mr. Brande.*

"The Italian natural philosopher, Melloni, has recently invented a mode of depriving the rays of light of caloric, which seems to open the way to great discoveries respecting the nature of light, when thus insulated. His method is very simple: he passes the sun's rays through a combination of transparent bodies (water, and a particular sort of glass, coloured green with oxide of copper), which bodies absorb all the caloric, and but little of the light. The light thus separated from its caloric is very yellow, with a green tinge; and when so concentrated by lenses, as to be as bright as the direct ray, the most delicate thermometer does not show the smallest degree of warmth. It has long been known that the prism, besides dividing the ray into its several pencils of colours, separated at one end of the spectrum a pencil of heat-making rays, and at the other a pencil of chemically-acting rays, both perceptible only by their effect; but this mode of severing the heat from the light offered little means of experimenting upon the unadulterated light, of which Melloni's discovery seems to give the philosopher as complete command as he has of the gases, &c."

Diamond is the base of hydrogen, iron that of oxygen: the two substances are the same; the only difference is in the temperature. Hydrogen preponderates at the top of the scale, oxygen at the bottom: hydrogen produces life at the temperature of 212, oxygen preserves the flame.* At the central point of the line of gravitation—our sun, which is ever in a state of combustion, these materials combine in the proportion of pure water.

The point of extreme heat is situated in the centre of our universe: from this point the matter ejected must decrease in intensity until it reaches the apex or point of extreme cold.†

> " From frost to fire, from fire to winter's frost,
> All, all has limits; heat and cold intense,
> Th' extremes creating; while progressive warmth
> Fills up between the modulated scale.
> Thus each degree, though varying, varies not
> For ever, by extremes adverse confined.
> Combustion here, and there the polar ice."—*Lucretius.*

This glass or crystalline boundary surrounds

* "To the term *combustible* is naturally attached the idea of the body so named affording heat and light. Of this position, it has been often remarked, that we have no evidence whatever. We know, on the other hand, that oxygen, the *incombustible*, could yield from its latent stores, in Black's language, both the light and heat displayed in combustion; for mere mechanical condensation of gas, in a syringe, causes their disengagement. A similar condensation of the *combustible hydrogen*, occasions, I believe, the evolution of no light."—*Dr. Ure.*

† It appears to have been the opinion of the great Leibnitz, that the following was the mode in which the earth was formed:

"Chaos first reigned; a conflagration melted the mass; and substances acquired different degrees of hardness from fluid water to vitrified gems, in proportion to the time they were in cooling."—*See Miscellaneous Works of Gibbon, Vol.* v. *p.* 463.

every body, large or small.* Without this atmosphere, or skin, bodies of a solid form could not move. It is the motion of the internal body which keeps up the temperature of the elastic

* "The word we render by the term *sky*, or skies, for it is always used in the plural, is derived from a root, (שחק,) which signifies to *comminute*, grind, or wear by friction; implying powers that come in contact from opposite directions, so as to be antagonist or conflicting powers." * * * * "The proper translation of the word, which our version, after the septuagint, renders *firmament*, is—the *expansion*. *And God said*, *let there be an* expansion, *and let it divide the waters*, &c. The cause of expansion is heat, which naturally divides and separates that in which it acts; as we see in the case of evaporation and the ascent of steam· and not only this, but the expansive force consolidates that whereon its impact is, whence our translation renders the word, after the Greek, στερεωμα, the *firmament*, that which renders all things *firm*, the action of which produces the cohesion of the atoms of bodies, and their agglomeration round a partial or general centre: in this last acceptation it is synonymous with the term *attraction*, and in the former with that of *repulsion*." * * * * "The terms expansion, then, and *firmament*, express the matter of the heavens in a state of action, going from or returning to its central fountain."—*Rev. W. Kirby's Introduction to Vol.* i., *Bridgewater Treatise.*

"In the different visions of the appearance of the Deity, as the Incessor of the chariot of the cherubim, it is stated, that expanded over their heads was a firmament like *crystal* or *ice;* that above this firmament was a *sapphire* throne; that one sat on his throne, round about whom was the appearance of a rainbow. So likewise in the vision of the apostolic prophet, St. John,—A throne was set in heaven, and one sat upon it, and there was a rainbow round about the throne, and before the throne was a sea of glass, like unto crystal; and in the midst of the throne, and round about the throne, were four cherubic animals, which proclaim the *Trisagium*. When Moses, Aaron and his sons, and the elders of Israel, went up into Mount Sinai, and saw the God of Israel, he stood upon what was like a pavement of sapphire and as it were the *body of heaven in its clearness.* In all these passages, the same idea seems to prevail with respect to the firmament,—it is

boundary, and enables it to increase its surface and extend its sphere, until it finally becomes compressed into a living muscular machine.*

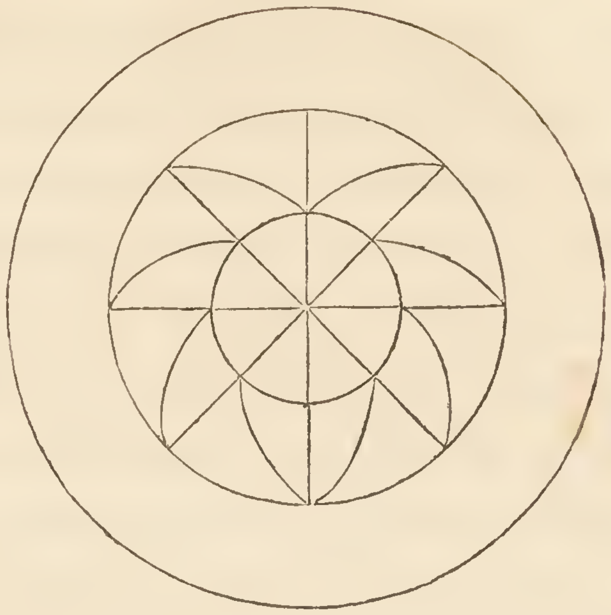
Matter has two kinds of heat, radiation and reflexion. The first decreases with its distance from the body which produced it, the second increases in proportion. Radiation is always from the centre to the surface of the body,—reflexion from the surface to the centre.

It follows that there are also two species of light,—the one radiated, the other reflected. Radiated light expands with its distance from the object which produced it, while the reflected light contracts in a corresponding manner; the one travels outwards, the other verges inwards.

like *ice*, or the terrible crystal in one,—a sea of *glass* like crystal, or crystallizing, emitting the splendour of crystal in the other,—like the *body of heaven* in its clearness in the third."—*Kirby.*

"Luminous emanations have been observed from human bodies, as also from those of brutes. The light arising from currying a horse, or from rubbing a cat's back, are known to most. Instances of a like kind have been known on combing a woman's head. Bartholin gives us an account, which he entitles *mulier splendens*, of a lady in Italy, whose body would shine whenever slightly touched with a piece of linen. These effluvia of animal bodies have many properties in common with those produced from glass; such as their being lucid, their snapping, and their not being excited without some degree of friction; and are undoubtedly electrical, as a cat's back has been found strongly electrical when stroked."—*Ency. Britannica.*

* "Shell is the product of the animal's own system: sometimes it is internal, sometimes external. The skeleton of articulata is *exterior*, that of vertebrata *interior* to the body."—*Dr. Roget.*



All active heat, radiating from the sun in the heart-form to the exterior or boundary of the fœtus, can go no farther, (being at its greatest point of dispersion:)* it is reflected thence to the sun in straight lines,† these lines becoming more and more concentrated until they meet upon its surface, which being the universal focus becomes perfectly luminous.‡

* "Heat, if covered, *reflects*."—*Dr. Ritchie.*

The angle of reflexion is always equal to the angle of incidence, the degree of gravitation governing the quantity and quality of the matter thrown off.—"Reflexion and refraction form a quadrant of 90°."—*Dr. Roget.*

† "Light travels in straight lines."—*Dr. Roget.*

‡ "A new method of diffusing light through a theatre has been discovered by a mechanist at Venice. By the aid of parabolic mirrors, the light of many lamps is concentrated over an opening made in the ceiling of the theatre, and reflected down on a system of plano-concave lenses, of a foot in diameter, which occupy the aperture, and convey into the theatre the rays of light, which arrive at them parallel, and depart from them divergent. From the pit the lenses are alone perceived, which resemble a glowing furnace; and although the luminous focus is sufficient to light the whole of the theatre, it does not dazzle, and may be viewed without fatiguing the eyes. The apparatus being entirely concealed, accommodates itself readily to all the changes which the representation can require. It likewise occasions neither smoke nor bad odours, and has none of the inconveniences of the ancient system."

Light is produced by matter being extended until the whole becomes visible; darkness by matter being compressed until all, saving the surface, is concealed. The celestial ovum existed in a darkened state, that being the quality of matter when compressed or inactive: fluidity or active life having commenced in the ovum, light was the result. By every subsequent movement of that ovum, it has rejected its impure and dark materials to its surface, and has become internally leavened, the centre being light as day, the surface or base of the Zodiac corresponding to the darkness of night. "And God said, Let there be light, and there was light; and God saw the light, that it was good; and God *divided* the light from the *darkness;* and God called the light *day*, and the darkness he called *night*; and the evening and the morning were the first day." *Genesis*, i., 3, 4, 5.

The sun being in the centre of the universal sphere, receives every ray of light in the entire universe at its own body as a focus, (the other heavenly bodies, whatever their position, can be but partially illuminated;) thus the inhabitants of the sun must possess the united sum or amount of the knowledge of every other sphere. There is no night, or darkness, in the sun: "in Him there is no darkness at all."* Light is life, and one Being

* If darkness was the hiding or secret place of God, light must

having passed through all the varied shades from darkness to light, will finally be acknowledged by all a perfect Man, creating all, preserving all, and extending His light and mercy to infinity.

All colour depends upon light and heat. The matter travelling to the centre of every sphere, meeting that rejected thence at right angles, produces every variety of colour. This fact may be illustrated by observations on any common crystal. When we reflect that our planet is constantly encased in crystal, and that the solar matter falling from without, and its own individual matter rejected from within, are perpetually cutting that crystal case at right angles, we shall not be surprised at the varied and beautiful shades of colour witnessed on our earth's surface.* The primitive colours being seven in number, must vary in intensity with the degree of

have been exactly the reverse,—His *revelation.* The first was the latent, the second the active production of the all-powerful Creator. (See note to page 11.)

"Newton, in describing the laws of the projection of shadows from opake bodies, tells us expressly, that shadow is a mere privation of light."

* The rainbow is an illustration of the point in question, and indeed Anaxagoras believed it to be produced by "a refraction of the sun's light upon a thick dark cloud opposite to him, as a *looking-glass:* for the same reason (saith he,) appeared, chiefly in Pontus, two or more suns."—*Stanley.*

"Mr. Green says that, in his 205th balloon ascent, 'as they rose they had a beautifully distinct view of the metropolis and country around, which continued for some time, when they pierced the clouds,

gravitation or distance from the centre of the sphere. "It is worthy of notice that when powders of the several primitive colours are mixed together, white is produced, this white never being pure, but mixed with some portion of black."*

The apex or point of attraction in the universe being the point of darkness, all the ascending gradations thence progress from perfect black to pure white at the opposite extreme.†

That light is absorbed by black objects and not

but were still able to see the distant country. The sun, at their rising, was obscured behind a cloud, which hung down to the horizon; but as they mounted up they gradually brought the great luminary within sight, and the effect was novel and curious, from the circumstance of the part of the cloud, between the aeronauts and the sun, forming two connected segments of a circle, the angle of which was nearly in the centre-line of the sun's disc.' Mr. Green says he never in all his ascents witnessed a similar phenomenon. 'Mounting still higher, the full disc was visible, and continued so, long after it had set to the inhabitants below.' The highest altitude Mr. Green attained as indicated by the barometer, was 9,500 feet, or about a mile and three-quarters."

* "The sun is perpetually pouring forth a flood of light, in variously coloured rays, from its own body; but must the body of the sun be necessarily violet, indigo, blue, or some other tincture discoverable by the solar prism? or even a tincture derivable from an intermixture of the whole? No astronomer supposes that it is so; no one, in reality, supposes that, although heat and light are continually issuing from it, the substance of the sun is one uniform mass of heat and light in itself."—*M. Good.*

† "I have (as I think I elsewhere mentioned,) seen in Italy, among rarities, a large piece of crystal, about the bigness of my two fists, whereof the pyramidal part was of a transparent green, the vertex being richly tinged like an emerald; but the further the colour spread

by white, is because the former are porous and have the simple power of attraction alone. White objects have double power: they are always smooth at the surface, and not only attract, but repel.*

Leonardo da Vinci maintained, as the cause of the blueness of the sky, that it was produced on this

from the vertex, the fainter and paler it grew; so that, before it came near the base, it was quite spent, if I may so speak, leaving the bigger part of the stone transparent, but colourless, like ordinary crystal."—*Boyle's Essay on Gems.*

"The middle colour in the prismatic series of any three may be produced by a mixture of the two extremes: thus a mixture of violet and blue gives us an indigo; indigo and green a blue; blue and yellow a green; red and indigo a violet colour."

"In gems that are less precious, and not so transparent, especially in agates and opacous gems, I could easily give a multitude of instances of the differently tinted parts of the same entire stone. And I usually wear in a ring a small sardonix that was once a great prince's, wherein there are three portions, one within another, the uppermost black, the middlemost of a kind of chesnut colour, the other of a blue, almost like a turquois; each of which portions is exactly of a fine oval figure, and each of the two uttermost is throughout of a very uniform breadth as well as colour, and exactly parallel to the other."—*Boyle.*

"Cats-eye is the name given to a very hard stone, which approaches more or less to a white or green, and is semi-diaphonous, with *a streak of the breadth of a line in the middle,* which streak is much whiter than the stone itself, and throws its light to whatever side soever this is turned. In this respect, therefore, it resembles a cats-eye, whence it derives its name. The Moors say that these stones approach in hardness to the diamond. They are found in the island of Ceylon."—*Knox's Ceylon.*

* "Polarized rays are not indifferent to the surface."—*Dr. Roget.*

"Bodies that reflect all the rays appear white, those that absorb them all seem black. * * * Colour is not a property of matter, but arises from the action of matter upon light."—*Mrs. Somerville.*

principle; that a black body viewed through a thin white medium, creates the sensation of blue. This is exactly the case with us, when we look up through the earth's atmosphere at the particles thrown off by the sun. The combustion always going on at the surface of bodies is maintained in the higher regions of our atmosphere, producing charcoal: this matter viewed through the white medium in which we move causes the appearance of blue. At night, on the contrary, when our portion of the earth is turned from the sun towards the iron boundary of the celestial fœtus, the sky presents a totally different hue.*

Sound is nothing more than the report of a long-

* "M. de Saussure, when on the top of Mont Blanc, which is elevated 5101 yards above the level of the sea, and where consequently the air must be more rare than ours, says that the moon shone with the brightest splendour in the midst of a sky as black as ebony; while Jupiter, rayed like the sun, rose from behind the mountains in the east." *Append. Vol.* lxxiv., *Monthly Review.*

The following is the account, given by Dr. Barry, of the appearance of the sky as seen from the top of Mont Blanc: the observations of others were verified regarding the *blackish-blue* colour of the sky, particularly in and near the zenith, as seen from these lofty regions. The depth of this colour is known to depend on causes which make it vary with latitude, the elevation of the observer, the sun's altitude, the season of the year, &c.; but the tint appeared to me to derive not a little additional depth from the contemporaneous reception by the eye of rays from the snow; for having been particularly struck with its intensity, when in a valley many hundred feet below the summit, with high walls of snow around, I excluded the latter from the eye, and found the *tinge of black more or less completely to disappear.* To make this observation, I lay on my back, and closed my

continued explosion; and the perpetual combustion sustained, in the centre of the universe, with that of the individual bodies contained in it, produces what may be termed the harmony of the spheres. This is not the result of any sudden shock, as of a volcano, for instance, but a continued process, (at certain intervals, regulated by the distance of one orbit from another,) kept up in the heart or centre of all matter, and reflected back from the crystal case in which it is contained with the harmony of a musical note;* the chord struck and the matter which reverberates being in unison.† Our universe may indeed be compared with the glass tube in which hydrogen gas is burnt, and which thus produces musical tones.‡ In the words of the

eyes for some moments; then opened them on the zenith, the snow being shut out from view, by a cylinder formed with both hands. I do not find a shade, in 'Werner's Nomenclature,' corresponding with the colour, as seen either with or without the snow; and of course it is not easy to speak from recollection on this subject; but probably an approach to the blackest tint observed, might be made by taking from '*pansy purple*,' a little of its carmine red, and adding a very little more of raven black. As viewed without the snow, China blue, with the addition of a very little more of Prussian blue, might perhaps represent the colour. It did not insensibly pass into the pale whitish-blue of the horizon, but, what deserves remark, *terminated by a well-defined border at some ten degrees above it*."—*Dr. Barry's Narrative.*

* "Sound repeated at intervals produces a musical tone."—*Dr. Roget.*

† "Solid metal coming in contact produces sound."—*Dr. Roget.*

‡ "If a bottle containing the effervescing mixture of iron and

Psalmist, "Day unto day uttereth speech, and night unto night sheweth knowledge. There is no speech nor language where their voice is not heard. Their line is gone out through all the earth, and their words to the end of the world." *Psalm* xix.,

dilute sulphuric acid be shut with a cork, having a straight tube of narrow bore fixed upright in it, then the hydrogen will issue in a jet, which being kindled, forms the philosophical candle of Dr. Priestley. If a long glass tube be held over the flame, moisture will speedily bedew its sides, and harmonic tones will soon begin to sound." *Dr. Ure.* Sound has been shown to be nothing more than the report of a long-continued explosion, and the experiment just described affords a simple and striking illustration of the phenomenon—*speech.* The matter of the human heart being kindled by contact with oxygen, the supporter of combustion, produces a similar explosion by the jet thrown off in the form of breath. This jet of hydrogen is conveyed through the windpipe into the mouth, the sides of which are bedewed by it with moisture, and in proportion to the increased power of the machine, directed by the individual's will, is the peculiar action of sound produced in speech. "The principal organ of the voice is the larynx; for, when it is injured, the air passes through the windpipe without yielding any sound."—*Hooper's Medical Dictionary.*

In that valuable repository of philosophical facts, Tilloch's Magazine, we have the following notice of the effect of hydrogen gas on the voice. "*The Journal Britannique*, published at Geneva, by Prevost, contains the following article: 'Maunoir was one day amusing himself with Paul, at Geneva, in breathing pure hydrogen air. He inspired it with ease, and did not perceive that it had any sensible effect on him, either in entering his lungs, or passing out. But after he had taken in a very large dose, he was desirous of speaking, and was astonishingly surprised at the sound of his voice, which was become soft, shrill, and even squeaking, so as to alarm him. Paul made the same experiment on himself, and the same effect was produced. I do not know whether anything similar has occurred in breathing any of the other gases.'" Vol. iv., p. 214.

2, 4.*—Language belongs always to the *machine*:† the root of every language is the *matter* itself, which is unchangeable. All the parts or sounds in language being united, form one perfect whole enclosed in a circle. Thus the seven vowels may be considered analogous to the seven spheres of our universe enclosed within the eighth or Zodiac, and are expressed by the line passing through its centre, while the surface forms the consonants, or parts united together by those vowels. The former are sounds of harmony, the latter of discord.‡ It is worthy of notice, that all music is dependant upon seven notes. These may be compared to the seven spheres before mentioned of our universe, each of which produces a distinct sound, answering to its particular distance from the stroke or impulse received at the centre. Sound has existed from all eternity, and will continue to exist when time shall be no more. Thus the Scripture saith, "I am Alpha and Omega, the first and the last." "The Word was God."

All matter is purified by combustion, or what may

* "Sound passing over *ice* is doubled."—*Dr. Roget.*

† "There was once but one language among the sons of men. Upon the dispersion of mankind, this was branched out into dialects; and those again were subdivided: all which varied every age; not only in respect to one another, but each language differed from itself more and more continually."—*Bryant's Mythology.*

‡ "The atmosphere alone, of all matter, cannot combine its elements." "Sound, as well as light, admits of polarization."—*Dr. Roget.*

be termed boiling. Boiling always takes place at the galvanic, or upper end of matter. Combustion is produced by the force with which two hard bodies meet and unite: they may unite silently, or, if powerfully compressed and in quantities, will give off light, heat, and noise accordingly. By boiling, whole bodies are separated into parts: the refuse or coarser particles are thrown to the surface and form a scum, which continues to fall and diminish by degrees, as the liquid becomes purified. Thus we have, plainly, two species of matter, one pure, condensed into a whole; the other of an inferior quality, disunited into parts, gravitating over every side of the vessel, until by loss of heat it is condensed round the sides of the cauldron, and finally falls to the bottom or apex, where it becomes perfectly cold: we must also have particles flowing over within this scum from the *whole,* or united mass, mixing with the former matter at the bottom of the cauldron, constituting in itself the third species. If a new cauldron or receptacle be formed for this last, we shall be enabled, by a little of the pure matter thrown into the impure, to leaven the second material in the same way. Thus is every body purified by a little of the perfect matter being sprinkled into it, until the whole finally becomes leavened up into one complete mass, circulating around its primary. The sun is daily giving off

a portion of its pure material to the planets or organs, to enlighten and excite them into motion or a boiling state, by which means they, in their turn, purify a certain portion of the mass, which will eventually, become one entire living whole. Every organ is a machine or fountain from which spring other animal fountains.

I have hitherto refrained from saying anything about *space*: it must indeed be evident that it cannot exist within the range of our universe. Space signifies the room which may be occupied by the length, breadth, and thickness of any given body;* and the only general notion we can entertain of it is by the extent of this universe, which being formed of material substance, and itself an animal body, must occupy some certain portion of room. That which, in the beginning, was filled by the ovum, must have contained, prior to that period, matter of a lighter description displaced by the organization of that ovum.† Thus it is matter itself which fills all space: the heavy displacing the more

* "No space without matter."—*Mr. Brande.*

† Hydrogen gas is the lightest of all bodies; what however is wanted in solidity, is amply made up for in its volatility; it expands and bursts asunder the most powerful machine, extending itself into space infinite. (See page 152.)

The sun's body is equal in size to the combined masses of all the planets. What the sun has in bulk, they have in substance; the medium which connects the several masses is equally proportioned.

light, which again gravitates in its turn, to displace the former. The space filled by the ovum, must have been of smaller dimensions than that occupied by the fœtus which has progressed from it, and the locomotive being, proceeding thence, will require still more room. Matter being progressive is constantly extending itself and acting against space:* every fresh formed organ, by adding to the size and power of the whole mass, bringing it a step nearer to the period of its third locomotive state of existence. It is well known that the animal fœtus—Man, is not organized by one solitary effort, but attains its several parts in distinct succession, every movement towards organization being governed by the increase of strength in the heart or primary, which becomes empowered by degrees to throw off its materials to a greater distance: this is in every respect analogous to the Universal Fœtus.

There have been six movements in the organization of the celestial fabric—our Universe. The first of these progressive depositions planted the planet Mercury, answering to the aorta of the heart, or primary organ of the fœtus: this might be called the first day of creation. The second stage, or day,

* "No property or quality can be considered as inherently and inseparably belonging to a substance, if the substance can be conceived as existing without it. The only quality, without which matter is inconceivable, is *extension*."—*Dr. Crombie's Theology*, p. 115.

was the deposition of Venus, (answering, in the locomotive life, to the ovarium, or receptacle of the most pure eggs:)* Venus, like Mercury, being planted on the gravitating line at a certain distance beneath the heart. The third stage of creation was the formation of the Earth, (corresponding, in the locomotive life, to the uterus, in which the eggs, before alluded to, are deposited.) Mars,† Jupiter, Saturn, and the Georgium Sidus, have also been created in their respective order of distance from the sun or centre.

Man is first formed from particles of matter into an egg: then from the solid egg into a triangular cavity, the heart. The heart shoots forth its stems, (veins and arteries,) the same as a plant or tree, depositing at the end of every shoot a new organ: these organs are all formed perfectly *separate*, and at *a distance* from *each other, until* the *whole frame* of *man* is *complete*.‡

The heart shape is the only one which allows an

* The uterus and ovarium, with the ovum, have not been sufficiently investigated. The ovum is enveloped in the ovarium, and the ovarium again in the uterus, and the whole is as perfect in the infant babe newly come into the world, as it is in the full-grown female.

† The planet Mars will answer hereafter to the female placenta, which is constantly undergoing combustion and purification.

‡ "Authors have generally considered the arteries and veins as forming each, by their union, a general cone, whose basis corresponds to the extreme parts, and the apex to the heart."—*Bichat.*

Mr. Boyle, in his Essay on Gems, describes some Cornish diamonds

overflow of oil or matter without waste: this has been shown by the manner in which the matter, flowing over each side and meeting at the apex, is united there, and formed into the several parts or organs in turn:* these organs again producing the

having "a pyramidal termination, made up by several resembling and curiously figured planes, that terminated in a solid angle or apex," of which these planes, being *six in number*, concurred in a *line*, and adds that "they seemed to have been formed separately in a fluid ambient, save at the bottom, where they were fastened to the rock, as appeared by an opacous root, if I may so call it, which still adhered to most of them."

"It might, perhaps, be expected, that an organ so precious, and of such central and primary importance, as the heart is, should be defended by a case. The fact is, that a membranous purse or bag, made of strong tough materials, is provided for it; holding the heart within its cavity; sitting loosely and easily about it; guarding its substance, without confining its motion; and containing likewise a spoonful or two of water, just sufficient to keep the surface of the heart in a state of suppleness and moisture. How should such a loose covering be generated by the action of the heart? Does not the inclosing of it in a sac, answering no other purpose but that inclosure, shew the care that has been taken of its preservation?"—*Paley's Natural Theology.*

* "1. The *heart* (such care is taken of the centre of life) is placed between two soft lobes of the lungs; is *tied* to the mediastinum and to the pericardium, which pericardium is not only itself an exceedingly strong membrane, but *adheres* firmly to the duplicature of the mediastinum, and, by its point, to the middle tendon of the diaphragm. The heart is also *sustained* in its place by the great blood-vessels which issue from it.

"2. The *lungs* are *tied* to the sternum by the mediastinum, before; to the vertebræ by the pleura, behind. It seems, indeed, to be the very use of the mediastinum, (which is a membrane that goes straight through the middle of the thorax, from the breast to the back,) to keep the contents of the thorax in their places; in particular to hinder

secondary organs from themselves. By the constant overflow of this matter, the heart is preserved, and

one lobe of the lungs from incommoding another, or the parts of the lungs from pressing upon each other when we lie on one side.

"3. The *liver* is fastened in the body by two ligaments; the first, which is large and strong, comes from the covering of the diaphragm, and penetrates the substance of the liver; the second is the umbilical vein, which, *after birth, degenerates into a ligament.* The first, which is the principal, fixes the liver in its position, whilst the body holds an erect posture; the second prevents it from pressing upon the diaphragm when we lie down; and both together *sling* or suspend the liver when we lie upon our backs, so that it may not compress or obstruct the ascending vena cava, to which belongs the important office of returning the blood from the body to the heart.

"4. The *bladder* is tied to the navel by the urachus, transformed into a ligament: thus, *what was a passage for urine to the fœtus, becomes, after birth, a support or stay to the bladder.* The peritonæum also keeps the viscera from confounding themselves with, or pressing irregularly upon, the bladder; for the kidneys and bladder are contained in a distinct duplicature of that membrane, being thereby partitioned off from the other contents of the abdomen.

"5. The *kidneys* are lodged in a bed of fat.

"6. The *pancreas*, or sweetbread, is strongly tied to the peritonæum, which is the great wrapping-sheet, that encloses all the bowels contained in the lower belly.

"7. The *spleen* also is confined to its place by an adhesion to the peritonæum and diaphragm, and by a connexion with the omentum. It is possible, in my opinion, that the spleen may be merely a *stuffing*, a soft cushion, to fill up a vacancy or hollow, which, unless occupied, would leave the package loose and unsteady; for, supposing that it answers no other purpose than this, it must be vascular, and admit of a circulation through it, in order to be kept alive, or be a part of a living body.

"8. The *omentum*, epiploon, or crawl, is an apron, tucked up, or doubling upon itself, at its lowest part. The upper edge is tied to the bottom of the stomach, to the spleen, as hath already been observed, and to part of the duodenum. The reflected edge also, after forming the doubling, comes up behind the front flap, and is tied to the colon and adjoining viscera."—*Paley's Natural Theology.*

increases in power: the carbon resulting from the combustion, by falling, forms the lamp destined to receive the oil of life.* As this lamp is kept constantly supplied with oil, the flame rises from the carbon or wick, and forms a wall or partition through the very centre of the heart, depositing, at the further extreme, the pure seed for the brain:† this partition is the fulcrum or balance between the brain and uterus. Every vertebra is constructed on this principle, (see the opposite diagram,) so also are the joints.‡

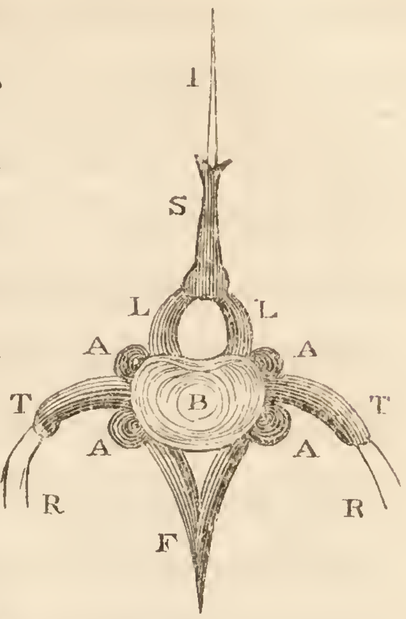
"The number of elements which enter into the composition of a vertebra, has been differently estimated by different physiologists; but the following are certainly entitled to that character.

* "Ham, as the sun, was styled Ait; and Egypt, the land of Ham, had, in consequence of it, the name of Ait, rendered by the Greeks Αετια; Εκληθη (ἡ Αιγυπτος) και Αερια, και Ποταμια και Αιθιοπια, και AETIA. One of the most ancient names of the Nile was Ait, or Αετος It was also a name given to the eagle, as the bird particularly sacred to the sun: and Homer alludes to the original meaning of the word, when he terms the eagle Αιετος αιθων. Among the parts of the human body it was appropriated to the heart, for the heart in the body may be esteemed, what the sun is in his system, the source of heat and life, affording the same animating principle. This word having these two senses was the reason why the Egyptians made a heart over a vase of burning incense, an emblem of their country."—*Bryant's Ancient Mythology, vol.* i. *p.* 22, 23.

† "The spine is the great central column. One enlarged extremity of the spine constitutes the brain."—*Dr. Roget.*

‡ "The brain is very analogous to the vertebræ. The scull appears to be formed of three vertebræ."—*Dr. Roget.*

They are represented in their relative situations in the diagram. The first is the part which forms the *nucleus* or *body* (B) of the vertebra; and its ossification begins at the centre. Next in importance are the two bony plates or leaves, as they may be called, (L,L) which proceed from the sides of the body, and embrace the spinal marrow,



which is situated between them. The fourth essential element is the *spinous process* (S), which unites the two leaves, and thus completes the superior arch, of which it may be regarded as the key-stone, for the protection of the spinal marrow. Then come the two *transverse processes* (T,T), which extend outwards from the sides, and with which the arches of bone, constituting the ribs (R,R), are generally connected. These are the six parts which may be considered as the elements that are most essential, and most constantly present in the composition of the vertebræ. But some other parts may also be noticed as of very frequent occurrence; such are the bony plates which cover the two flat portions of the bodies of the vertebræ, forming the surfaces immediately contiguous to the intervertebral ligament; which surfaces, in some of the *lower orders* of the vertebrata, become articular. There

is frequently, also, a development of processes (F), forming arches and spines at the lower surface of the vertebræ, or the one opposite to that which gives rise to the superior arches already mentioned. This structure is very generally met with in fishes, and it is observed also in the Cetacea. The arches thus formed enclose a large artery, which is the continuation of the *aorta*, or the main artery running along the back, immediately under the spinal column. There are still other processes, less constantly present, and variable in their shape. They form articular surfaces for the purpose of being connected with the surfaces of corresponding processes in the contiguous vertebra. Of these there are four (A, A, A, A) belonging to each vertebra, two in front, and two behind. These, however, should not be included among the primary elements of the vertebræ, because we find them, in different instances, occupying different positions, and formed sometimes by extensions of the bodies, and at other times of the leaves. In following them through the several tribes of animals, we observe them shifting their places, in various ways, and not even preserving any constancy in their number."*

Man is always made of the same materials, and every one of his organs constructed upon the same

* Dr. Roget's Animal and Vegetable Physiology, vol. i. p. 393.

plan. Sir Charles Bell, speaking of the bones, says they begin to form at the centre of the shaft: so do the organs, which always precede the formation of bone in the fœtus. The only difference is, that the first are produced by the extension or growth of the fabric, the latter by its contraction at the period when it ceases to grow, which always takes place prior to its entrance into the locomotive state of existence.* I must leave to astronomers, mathematicians, and anatomists, the task of uniting their efforts for the discovery of the identical parts of the celestial machine represented by the different portions of our universe. The several zodiacal divisions are, no doubt, combining for their distinct and peculiar end; and probably, every part might be determined by anatomical reference to the primary line of gravitation. The planetary organs, also, may be deciphered by means of that mighty chain of which they form the several connecting links. The subject is of too imperative a

* "The septa of the brain, probably, prevent one part of that organ from pressing with too great a weight upon another part. The processes of the dura mater divide the cavity of the skull, like so many inner partition-walls, and thereby confine each hemisphere and lobe of the brain to the chamber which is assigned to it, without its being liable to rest upon, or intermix with, the neighbouring parts. The great art and caution of packing, is to prevent one thing hurting another. This, in the head, the chest, and the abdomen, of an animal body, is, amongst other methods, provided for by membranous partitions and wrappings, which keep the parts separate."—*Paley's Natural Theology.*

nature to be left to the hazard of conjecture; and I confidently anticipate that a correct estimate may eventually be obtained, not only of the precise figure, but of the size, age, and qualities of the celestial living being, in whose existence is involved the fate of myriads.

Man has progressed from the minute single drop of water, and continued to enlarge his sphere of existence to the present magnitude of this vast universe:* all the planets belong to his body and

* "Plato says, 'that matter, the inform matter, whereof every creature is compounded, is represented by *water, continually flowing*, easily receptable of any form.' This being first in the angelic mind, angels are many times expressed by water, as in the Psalms, 'the waters above the heavens praise God continually,' so interpreted by Origen; and some Platonists expound the ocean (styled by Homer, Father of Gods and Men,) this angelic mind, principle, and fountain of all other creatures; Gemistius, Neptune; as commander of all waters, of all minds, angelical and human. 'This is that living fountain, whereof he that drinketh shall never thirst; these are the waters whereon (David saith) God hath founded the world.' "—*Stanley.*

"It was from Egypt likewise that both Homer and Thales were taught, that 'water was the first principle of all things, and the cause of generation.' For what, in reality, is the poet's Ocean, but the Egyptian Osiris, or his Tethys, but their Isis? the name itself plainly importing some power, which is supposed *to nourish and cherish all nature.* And, indeed, many of those words which are made use of by the Greeks to express generation, or a production into being, are derived from a root or original, which signifies, in their language, water or moisture. Nay, Dionysius or Bacchus himself, who is the same deity as Osiris, is called by them Hyes, (or the Wetter,) signifying thereby his being *lord of the humid nature.* Nor, must it be omitted, that Hellanicus, in his history, instead of Osiris, all along makes use of the term Usiris, a name derived from, and excellently well according with the supposition of his being the principle of

are growing to a definite size; which attained, they will contract the fluid medium in which they now move, and finally, being united to the sun or primary, become one grand celestial whole. This universe, its atmosphere, sun, moon, and stars, with every other phenomenon, are the production of man himself. All,—all is man, man constantly undergoing decomposition, and as constantly remodelled with the same materials. By the decomposition of the external boundary or atmosphere, the internal organs are formed and sustained, and the heart enabled to enlarge its sphere of action. The internal machine is equally important to the preservation of the external: each part of an animal body being essential to the existence of the whole mass. In

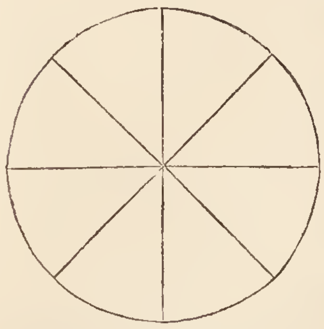
moisture: and this name, says he, 'I heard given him by the priests themselves.' "—*Plutarch's Treatise of Isis and Osiris.*

The following is the prayer of one of the Hindu priests while sipping water, "Water! thou dost penetrate all beings; thou dost reach the deep recesses of the mountains; thou art the *mouth of the universe;* thou art sacrifice; thou art the mystic word *vasha;* thou art light, taste, and the immortal fluid."—*Asiatic Researches.*

It is not a little remarkable, that *water* should have been such an object of veneration in the opinion of ancient, as well as modern nations. That the Hindoos should have worshipped it with various rites in their river Ganges, the Americans as the "Father of Rivers," the Mississippi; that water should have been essential in the rites of the Jews, and that the catholics should have used it with the sign of the Cross; that its use should, in fact, have been enjoined by our Lord, as the sign of *regeneration* and purity, and that it has been accordingly employed by the Christians in the ceremony of baptism. Finally, that water should be the emblem of the Holy Spirit, the Father himself.

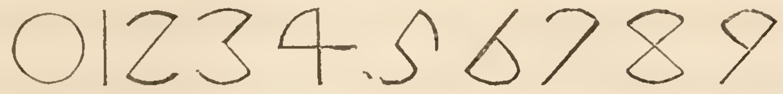
the words of Cuvier, "That which is true of the least animal, that which is true of the most perfect animal, Man, of the little world, as the ancient philosophers called it, is necessarily not the less true of the great world, the globe and all its inhabitants. The beings which compose it, and which people it, contribute to its existence; they are necessary to each other, and to the whole; they have been so since this existence subsisted; they will be so as long as it shall subsist. This is like an individual: all its parts act on each other. We can imagine other worlds more or less rich, more or less peopled, the preservation of which rests on other means; but we cannot conceive the present world deprived of one or several of the classes of beings which inhabit it, any more than the body of man deprived of one or several of its systems of organs."

It would appear, that all numbers have originated from the simple framework, or scaffolding, of the universal machine. (See the diagram.) The



arithmetical characters at present in use are all derived from the circle, being simply and easily constructed out of the diameter and circumference. The cipher 0 is, I conceive, most properly the commencement of the scale: the primitive egg, as it were, which contains the other

nine characters. They may be constructed, I think, without much ingenuity, as follows.



Whatever form matter may assume, it acquires its power, grandeur, and sublimity by the unity of its particles.*

The diamond crucifix (see the diagram, page 73) may be considered a perfect emblem of our universe, being impressed upon it in the lines of gravitation, and of the equinoxes: the cross, forming the lines of expansion, has before been shown to be the scale and compass of matter (See note, page 22). Speaking of the Jewish allegories, Colonel Vallencey says: "And hence the Sephiroth tree, or tree of numbers of the Cabalistical Jews; and this tree contained ten names, viz. corona, sapientia, prudentia, clementia, gravitas, ornatas, triumphus confessio laudis, fundamentum, regnum. The number ten seems to have been fixed on, because, as relating to numerals, ten was called perfection, as from thence all nations began to count anew. For this reason, the Egyptians expressed the number ten by the word *mid*, that is, perfection; and the Irish call it *deag*, a word of like meaning; and for this reason, the Chaldeans formed the word Jod, or number ten,

* Hydrogen is the body always taken as *unity* or *one*.

by an equilateral triangle, △, which was the symbol of perfection with the Egyptians. The Egyptians doubled the triangle, thus ⧖, and then it became a cross of St. Andrew, or the letter X or ten, that is, *perfection*, being the perfect number, or the number of fingers on both hands; hence it stood for *ten* with the Egyptians, Chinese, Phœnicians, Romans, &c., and is so used with us at this day. The Mexicans also use the same figure in their secular calendars. The Tartars call it *lama*, from the Scythian *lamh*, a *hand*, synonymous to the *jod* of the Chaldeans; and thus it became the *name of a cross*, and of the High Priest, with the Tartars; and, with the Irish, *luam* signifies the head of the church, an abbot, &c. "Ce qu'il y a de remarkable c'est que le grand prêtre des Tartares, port le nom de *lama*, qui en langue Tartare signifie *la croix;* et les Bogdoi qui conquirent la Chine en 1644, et qui sont soûmis au *dalae-lama* dans les choses de la religion, ont toujours des *croix* sur eux, qu'ils appellent aussi *lamas*."

"From this X, all nations begin a new reckoning, because it is the number of fingers on both hands, which were the original instruments of numbering; hence, יד (*id*) *iod*, in *Hebrew*, is the hand and the number ten, as is lamb with the Tartars."

Again Vallencey says, "And here, I think, we may trace the origin of the *Idæi Dactyli* or *Curetes;*

for Dactylus is only a Greek translation of the Phœnician יד (*id*) *iod*, as *lamh*, in Scythian, whence the *lama* of the Tartars."*

It is not surprising, that as the universe is bounded by 36 decans=360°, and contains within those decans, one decan or cross, (the measure of the whole,) as well as of the previous numbers, the scale should have ended with that perfect cross. Although it is not my intention to involve myself in the present work in any topics of religious discussion, it seems unavoidable to notice here the extraordinary fact, that this perfect sign, the cross, the object of veneration from the earliest period, the idol alike of Jew, Papist, Infidel, and Christian, should be associated with the words Lamb, *iod*, or God, High Priest, and Head of the Church, and be worshipped under these various names in divers countries: being not only impressed on innumerable coins and monuments, but used to denote the planetary and chemical terms, and even believed to be expressed upon the universe itself; for Justin says, that "Plato, in his Timæus, philosophising about the Son of God, reports that he was expressed upon the universe in the form of the letter X." And again, that "the *second* power of the Supreme God was figured on the universe, in the shape of a cross."

* Higgins's Celtic Druids.

5

That the human being, contained in the sphere of the universe, is of celestial origin, there can be no doubt; and it is equally certain that this being is of a perfect nature: but, whether the Saviour be thus the identification of God with his people is a point I shall leave to the consideration of the impartial reader; the sun has certainly been worshipped under similar ideas, and by it the whole universal fabric has been formed and preserved.

The increasing size of the vast machine upon which so much depends, claims our next enquiry. That which grows as a whole, must do so at the same time in all its parts; I shall therefore consider the progressive growth of the whole fabric, as developed at one of its primary organs, which comes under our powers of observation, viz. the planet earth.

The number of zodiacal degrees is 360, and our earth, in traversing its orbit, daily occupies one of these degrees, passing through all the 360 in succession in its annual progress around the sun. The sun is daily throwing off matter in the heart-form, and matter is daily returned from the Zodiac, in straight lines, back to the sun or centre. There are, therefore, two opposing currents: that of the sun, striving to bulge or extend the terrestrial machine; that of the Zodiac or boundary, to contract it in a corresponding degree.

The mode of growth of the celestial machine being determined, we are brought to reflect upon another very important point, viz. its duration. Each particular stage of existence has its prescribed limits, and in process of time, the universal fœtus must attain its third or locomotive state. Mr. Whewell observes, "It is no way unlikely that the whole duration of the solar system should be a period immeasurably great in our eyes, though *demonstrably finite.** Such calculations depend, in some degree, on our relation to the vast aggregate of the works of our Creator. No one, who has dwelt on the thought of a universal Creator and Preserver, will be surprised to find the conviction forced upon the mind of every new train of speculation, that, viewed in reference to Him, *our space is a point, our time a moment, our millions a handful, our permanence a quick decay.*"†

The progressive development of the fœtal organs has already been explained, with the reciprocal

* "Duration is but, as it were, the length of *one straight line*, extended in infinitum, not capable of multiplicity, variation, or figure; but is one common measure of all existence whatsoever, wherein all things, whilst they exist, equally partake For this present moment is common to all things that are now in being, and equally comprehends that part of their existence, as much as if they were all but *one single being*; and we may truly say, they all exist in the same moment of time."—*Locke.*

† "Could the mind, as in number, come to so small a part of extension or duration, as excluded divisibility, that would be, as it were, the *indivisible unit*, or *idea*; by repetition of which it would make its more enlarged ideas of extension and duration."—*Locke.*

connexion between them and their primary, the heart, by means of the elastic fluid medium. This fluid, similar to that which circulates in every animal fœtus, is of a white transparent nature, and increases in quantity during the progression of the animal to its full growth; but when the organs have attained the completion of their structure, and the machine is about to enter upon its third locomotive state of existence, a change takes place in the universal atmosphere, and contraction begins throughout the entire fœtus. By the clouding or thickening of the Zodiac, or external boundary, the fluid medium becomes also thickened and begins to stagnate, and this process increases in intensity until the change is completed.*

By the contraction of the fluid medium, a retardation in the annual revolution of the planets is occasioned; and this may account for the loss of eleven days in the computation of time. A writer of the present day observes, "It may be millions of millions of years, before the earth's retardation may perceptibly affect the apparent motion of the sun; but still the day will come (if the same Providence which formed the system, should permit it to continue so long,) when this cause will entirely change the length of our year, and the course of our seasons, and finally stop the earth's motion round the sun

* See pages 382—388.

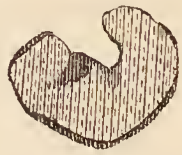
altogether. The smallness of the resistance, however small we choose to suppose it, does not allow us to escape this certainty. *There is a resisting medium;* and therefore the movements of the solar system cannot go on for ever. *The moment such a fluid is ascertained to exist, the eternity of the movements of the planets becomes as impossible as a perpetual motion on the earth.*"*

> "Death! great proprietor of all! 'tis thine
> To tread out empire, and to quench the stars;
> The Sun himself by thy permission shines,
> And, one day, thou shalt pluck him from his sphere!"
>
> *Young.*

Whether it is in the heavens above, the internal

* "Mr. Mackintosh, in his concluding Lecture on the Electrical Theory of the Universe (delivered on the 7th of November, 1836,) remarked, that if the earth be gradually approaching the sun, it was natural to conclude, that the length of the year was becoming less in a relative proportion. Accordingly, we find that the Chinese, Indians, Chaldeans, Egyptians, Greeks, and Romans, however they differed on other points, all agreed in giving to the year a value greater than that which was known to be the true value at the present day. Now, the great object of the ancient astronomers being the calculation of eclipses, unless they had a knowledge of the true time, how could they have predicted the recurrence of an eclipse with any certainty? But the Sothian period of the Egyptians put the matter beyond dispute. The Egyptians had more than one calendar, in one of which the year consisted of 365 days; they had no leap-years, but the supernumerary hours and minutes were allowed to accumulate until they formed a whole year, which was added to the amount, and this they called a Sothiac period, which originally consisted of 1,461 years, at the present day it would require 1,506 years to complete a Sothiac period; the difference being forty-five years. And were we to suppose that the Egyptians (the most eminent astronomers that the world ever

cavity of the heart or sun, or the fluid medium surrounding it, all, all is undergoing one continued change, occasioned by compression. The central mass, the sun, is becoming gradually converted into a solid carbonated incorruptible substance: witness the increased number of black spots visible on its surface during even the last few years: (the sun's body being diamond, its combustion produces the charcoal spots alluded to.)* The annexed diagram affords a representation of one that occurred in the year 1789, the



produced) could not bring their Sothiac period nearer than within forty-five years of the true time!—we could not come to this conclusion, —and yet with this very imperfect time, these astronomers could calculate and predict eclipses! To suppose so was an absurdity; it was impossible to calculate an eclipse unless the true time were known.

"It was also found, that the apparent diameter of the sun was greater at the present day than it was found to be by the ancient Greek astronomers; and this also agreed with the assumption of the earth's approach to the centre. We were too apt to consider that these differences arose from the imperfect modes of observation pursued by the ancients, without considering that it was not only possible, but natural, that there should be an actual difference; seeing there is nothing stationary in nature, and that both the ancient and modern observations might be correct."—*Mechanic's Magazine.*

"The earth's motion is slower now than when St. Paul's was built."—*Dr. Ritchie.*

* "The combustion of the diamond is effected at three different temperatures. At the first and least elevated temperature, the diamond assumes a gray and black colour; this is the first degree of oxydation; it is the state of the plumbago and of the antracolite, or incombustible pit-coal.

"At the second degree of temperature there is a new, slow, and

nature of which was very remarkable.* The heart or sun, no longer receiving a fresh supply of fuel

successive combination of oxygen; it then constitutes the habitual state of our charcoal.

"Supposing, therefore, we could operate with sufficient precision to take from the surface of the diamond the black matter in proportion as it formed, during our process for burning it, we should undoubtedly convert the whole diamond into charcoal.

"At the third degree of combustion the diamond is wholly converted into carbonic acid gas, as we have shown before.

"Guyton Morveau applied the solar heat, by means of a great lens, to a diamond placed in a china cup, and surrounded by a proper apparatus, with a confined quantity of oxygen gas.

"In one experiment the diamond exhibited, first, a black point at the angle directly struck by the solar rays; after this, it soon became completely black, and of a coally appearance; the instant afterwards, *brilliant* and as it were *boiling points* were distinctly perceived on the black ground. It now began to *diminish in size*, and in a short time, no more than one-fourth was remaining."

* The diagram is taken from the Encyclopædia Britannica.

The following paragraph is from the *Reading Mercury*, 1835: "During the past week, a number of spots have been observed on the sun's disc, amounting to sixteen or seventeen, and a few of them of extraordinary magnitude. A double range of them, on the eastern edge, presented a very singular spectacle. There has not been a similar appearance since the year 1830."

The subjoined note was made by Sir William Herschel, at Feldhausen, near Wynberg, at the Cape of Good Hope, during the spring equinox of the present year:—"The sun at present is, and has long been, affected with a display of spots, extraordinary both in point of number and magnitude, and in every point of view extremely remarkable. They do not, however, appear to have affected its emission of heat; at least I perceive no marked excess or defect of radiation, as indicated by the actinometer this year, compared with corresponding seasons of 1834, 1835, and 1836. This instrument puts all such enquiries completely within our power."—*Morning Chronicle, Saturday, October* 7, 1837.

An ingenious individual in Providence in America, has very recently

from the amnios or fœtal atmosphere, becomes languid and unable to furnish, in its turn, the necessary supply to the organs within its sphere.*

It has before been shown, that while the top of a

succeeded, by means of a seven-feet telescope, constructed by himself on a new principle, in bringing the entire image of the sun into a darkened room upon a white screen to the size of *eight feet in diameter*. He writes us that his astonishment was great when he perceived that every spot now upon the face of the sun, nine in number, was distinctly transferred to the screen, and was so plain that he could see every movement of them in the various and sudden changes. He says he could plainly discover that those spots were immense bodies of smoke, apparently issuing from volcanoes; and as they seem occasionally forced up from the craters, now forming dense clouds, and now dispersing, he considers those phenomena as accounting for the rapid changes of those spots. The escape of such a vast quantity of gas from the interior of the body of the sun would, he observes, as it surrounds that luminary, produce that bright and dazzling appearance which is the atmosphere of the sun. This theory may not accord with the opinions of others who have made observations on the subject; but the writer, at any rate, entertains the strongest belief of its truth. With the same instrument, which is but just finished, he has also examined the moon, and states his conviction that the body is covered with perpetual snow and ice, the dark spots discoverable on its surface being frozen seas, and the lighter spaces land covered with snow. Those circular places which have a rising cone in the centre, he thinks, are extinguished volcanoes, as no clouds are perceptible over the moon's face; which, being covered with snow and ice, accounts, as he imagines, for its clear appearance, and for the absence of an atmosphere. This vast accumulation of frost and snow upon the moon's surface may be explained, the writer conjectures, by the nature of the moon's revolutions."

Anaximenes believed the sun to be "flat as a plate, of fiery substance," and that it "is eclipsed when the mouth out of which issueth its heat, is closed."

* "In the course of the incubation, the yolk becomes constantly thinner and paler by the admixture of the inner white. At the same

kettle of water is kept boiling by a source of heat applied beneath, the bottom remains perfectly cold; but cause that boiling to cease by abstracting from the water the source of heat or fire beneath, and the bottom of the kettle will gradually become heated till the hand can no longer be applied to it.* This is a most simple illustration of the present subject. Hitherto the sun, by combustion, has thrown off to the apex of the universe, or North Pole, a continued supply of crystalline matter; but when compression of the heart begins, as just described, by a want of fresh fuel there, the irritation is conveyed to the apex, and in succession to all the internal organs.† Thus, a mutual compression of every part of the fœtus must necessarily ensue.

time, innumerable fringe-like vessels, with flocculent extremities of a most singular and unexampled structure, form on the inner surface of the yolk-bag, opposite to the yellow ramified marks above mentioned, and hang into the yolk. There can be no doubt that they have the office of absorbing the yolk, and conveying it into the veins of the yolk-bag, where it is assimilated to the blood, and applied to the nutrition of the chick. Thus, in the chicken which has just quitted the egg, there is only a remainder of the yolk and its bag to be discovered in the abdomen. These are completely removed in the following weeks, so that the only remaining trace is a kind of cicatrix on the surface of the intestine." —*Blumenbach's Comparative Anatomy.*

* It is necessary to heat fluids from beneath: render the warm liquid lighter than the cold, and it rises in it.

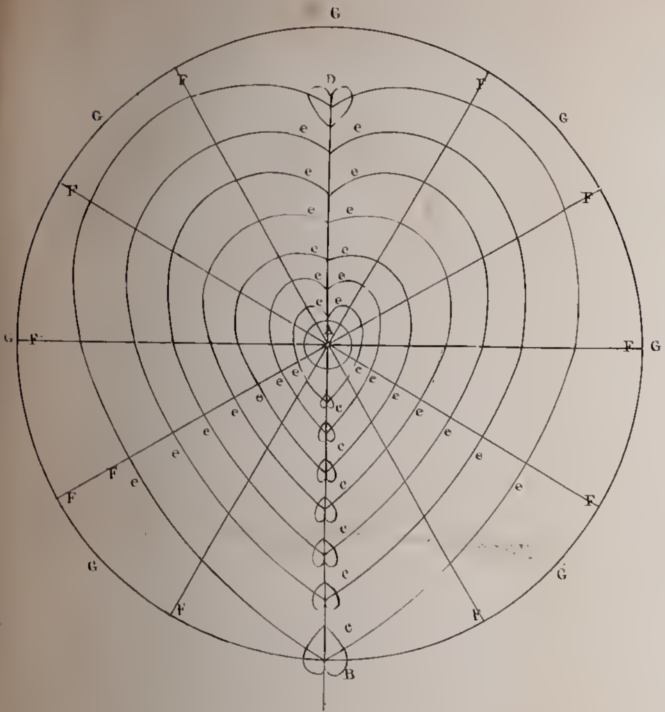
† "But the day of the Lord will come as a thief in the night; in the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also, and the works that are therein shall be burned up."—2 *Peter*, iii., 10.

The brain being the extreme point of the line, receives at its centre the united compression or weight of the whole fabric, and thus the vital spark is elicited: repulsion, or a rejection downwards to the apex, of the superabundant matter follows, until a complete retroversion of the line is brought about,* the brain becoming converted into the electric, or freezing, and the apex into the galvanic, or boiling, state; the oppression is thus once more returned to the heart; which becomes so powerfully condensed, that it draws all its varied cords, (the arteries and veins,) into one contracted sphere, (see the diagram;) and thus, every organ being fixed in its destined position, the whole mass coalesces to form one perfect machine.† The head, the broad and heavier end, falls or gravitates, drawing after it the lower portion of the body, and the third life or locomotive state commences. The fluid medium now attains the red colour of blood by the entrance of the external atmosphere through the mouth to the heart of the

* "It appears, from modern experiments, that the mariner's needle has lost its power of attraction. The needle, it would seem, acts from induction; and a good efficient needle to-day may lose much of its power to morrow, and in a short time become perfectly useless."

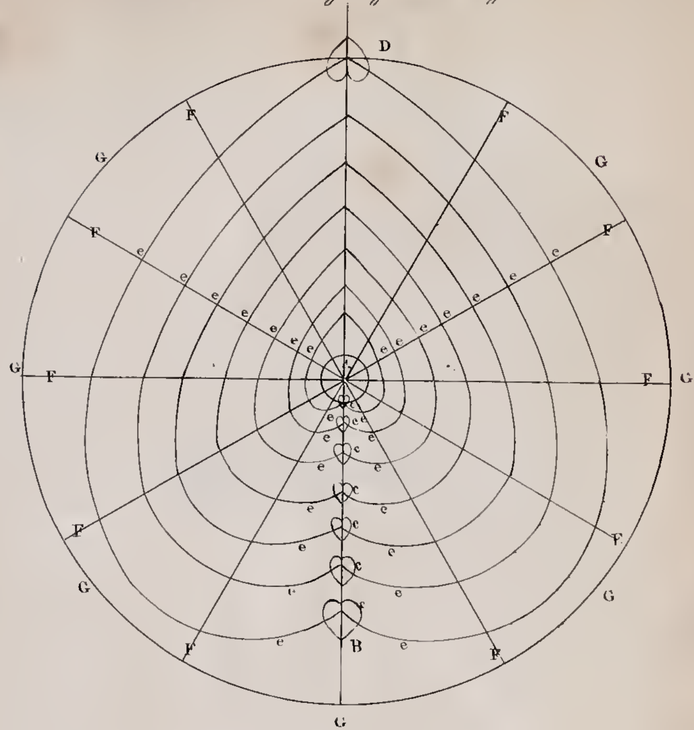
† "From the vacant spaces in some parts of the heavens, and the correspondent clusters of stars in their vicinity, Mr. Herschel concludes that the nebulæ or constellations of fixed stars are approaching each other, and must finally coalesce in one mass."—*Phil. Trans. vol.* lxxv.

The Universe prior to the Change.



A. The Heart, or Sun.
B. The North Pole, or freezing point.
c. The Organs, or Planets.
D. The Brain, or boiling point.
e. The Veins, or cordiform lines.
F. The Arteries, or straight lines returned to the heart.
G. The extent of the Universal Atmosphere.

The Universe undergoing the Change.



A. The Heart, or Sun.
B. The North Pole, now converted into the boiling point.
c. The Planets, changed in shape by compression.
D. The Brain, now become the point of freezing.
e. The Veins: the lower, and not as formerly the upper portion exhibiting the cordiform appearance.
F. The Arteries.
G. The Amnios, or Universal Atmosphere, changing its form.

[*To face page* 436.

fœtus, (every creature comes into the world with its mouth open:) the heart begins again to pulsate, and a new circulation thus commencing,* the organs of the celestial being are appropriated, for the first time, to their destined functions.

> "Roll on, ye Stars! exult in youthful prime,
> Mark with bright curves the printless steps of Time;
> Near and more near your beamy cars approach,
> And lessening orbs on lessening orbs encroach;—
> Flowers of the sky! ye too to age must yield,
> Frail as your silken sisters of the field!
> Star after star, from heaven's high arch shall rush,
> Suns sink on suns, and systems systems crush,
> Headlong, extinct, to one dark centre fall,
> And death and night and chaos mingle all!
> 'Till o'er the wreck, emerging from the storm,†
> Immortal Nature lifts her changeful form,
> Mounts from her funeral pyre on wings of flame,
> And soars and shines, another and the same."
>
> *Dr. Darwin.*

By uniting the study of physiology with that of astronomy, now that the Vital Principle is made known, we shall be enabled to determine the rest by natural consequences; life being one and the

* A double circulation now for the first time takes place. The fœtus is a white-blooded animal; it is the oxygen of the atmosphere that gives colour to the blood on the entrance of the child into the world.

† "The story of the phœnix rising from its own ashes with a twinkling star upon its head, seems to have been an ancient hieroglyphic emblem of the destruction and resuscitation of all things."—*Dr. Darwin.*

same thing, on the most extensive as on the minutest scale. "It is in the constitution of nature that the Deity is revealed;"* and that the Almighty Creator had some design in planting the ovum or seed of this universe, is as evident to me as that a ship-builder, when he builds his ship, intends it to sail upon the ocean, or a watch-maker, in making a watch, intends it to count time. The most profound and secret, yet simple, mechanism has been employed in its construction, and we are warranted in the supposition that some definite purpose is to be accomplished by the machine: that the Creator, in impressing the primary seed with the law of gravitation, foresaw that it would pass through the fœtal, and finally attain the locomotive state of existence; and that the life thus bestowed was ordained for the wisest and best of purposes.† The perfection of this life, what mind shall conceive, or what tongue shall tell? What thought shall calculate the immensity of power, the multitude of advantages to be concentrated in such a being? In rela-

* Dr. Crombie.

† "The machinist, when he completes his plan, foresees the effect of every wheel, every pinion, every joint, every spring of his machine, and can trace, in his own mind, every movement from the commencement of the series to the ultimate effect. And can we suppose, that the Deity constructed our system with less foresight than a human artisan would exercise? Or can we believe, that any event, however minute, can take place in His creation, the causes and consequences of which His prescience did not embrace?"—*Dr. Crombie.*

tion to so vast a machine, how does man shrink into a point, a mere atom, smaller than the smallest of the small grains to be found on the sea-shore. "When I consider the heavens, the work of thy hands, and the moon which thou hast made, Lord, what is *man* that thou art mindful of him, or the son of man that thou regardest him?" That his very hairs should be numbered in Thy sight? The being of man, as *a part of the vast fabric of the universe,* is however wound up in its destiny, and the Scriptures reveal ample evidence of the future condition of both.* They assert that man shall live hereafter a pure and perfect life, and that he shall possess "an habitation, not made with hands, eternal in the heavens." Thither then, to that word of God which confirms and explains His works, we refer our reader for the future history of the celestial living being which is now progressing with us

* "Nature frequently lodges under the same roof the animal and vegetable life, and unites the destiny of the one to that of the other. We see them bursting together from the same shell, blowing, expanding, propagating, dying, in a similar progression. At the same instant of time they present, if I may be allowed the expression, the same metamorphoses. While the plant is unfolding in succession its germs, its buds, its flowers, its fruits, the insect is displaying successively on one of its leaves, the egg, the worm, the nymph, the butterfly, which contains, like its parents, the seeds of its posterity, with those of the plant which nourished it. It is thus that Fable, far less marvellous than Nature, inclosed the life of the Dryad within the bark of the oak."—*St. Pierre.*

to that pure and perfect state: he will there learn that

> " This is the bud of being, the dim dawn,
> The twilight of our day, the vestibule.
> Life's theatre *as yet is shut*, and Death,
> Strong Death, alone can heave the massy bar,
> This gross impediment of clay remove,
> And make us, embryos of existence, free.
> From real life but little more remote
> Is He, not yet a candidate for light,
> The future embryo, slumbering in His Sire.
> Embryos we must be, till we burst the shell,
> Yon ambient azure shell, and spring to life,
> The *life of Gods* (oh, transport!) and of *Man*."
>
> *Young.*

CHAPTER IX.

MAN.

(Concluded.)

"Canst thou by searching find out God?"
JOB, xi., 7.

ANIMAL organization progresses from the most minute to a certain definite structure, part after part being formed and chained to its predecessor, until seven distinct organs are produced, which, when united together, constitute that most perfect of all animal structures—MAN.*

In the sixth and eighth chapters of this work, the plan upon which the machine is constructed has been explained, with the change from the fœtal to the locomotive state of existence: at this point I resume my narrative of the progressive life of Man.

* It is quite evident that the animal machine requires to be made ere it can be put in motion.

As soon as the fœtus is brought into contact with the atmospheric air, the lungs become inflated and inflamed, and the oxygen is immediately communicated to the expiring heart. Thus is fluidity restored to the machine, and distributed to the most distant parts of the system, giving motion to every organ and unconscious sensation to the whole fabric. The vessels, which in the fœtal life were merely appropriately distended, have now a new function to perform: they become irritated by fresh matter, and their elastic motion commences.* All matter sent from the heart (which is kept in a constant state of combustion,) is conveyed by the arteries to the extremities of the body; while travelling, it loses by degrees its elasticity or fluid heat, and, when deposited at the extremities, is apparently a lifeless inorganic mass.† Here, however, we have the most wonderful mark

* "The nerves are irritated by oxygen, but not by other gases."—*Dr. Roget.*

"The only sense which belongs to all animals, and which exercises its influence over nearly the whole of the surface of the body of each, is the touch."—*Cuvier.*

Majendie, in his thirteenth Lecture on the Nervous System, enquires, "Are all the external mouths of the nerves possessed of the same sensibility, or has each nerve its peculiar species of sensibility?"

† "M. Barruel, Director of Chemical Experiments to the Faculty of Medicine, after having made researches on the existence of iron in the blood, is of opinion that he could extract from the blood of a corpse iron enough to strike a medal as large as a 40fr. piece. This would

of wisdom presented to us: here it is, at the extremities of the body, that the organs are brought into use and made subservient to their primary; here, that fresh matter is deposited from external nature, to be communicated by the different organs of sensation to the minute veins, and by them transmitted to the heart.

The brain has been shown to originate from the heart or primary organ, (see pages 244, 246;) prior to the birth of the animal, it continues to derive its nutriment from the same source, increasing in size until, by the pressure of matter to its centre of attraction, friction takes place, when the lighter portions rise to the surface, and the heavier descend, forming a membrane or bag to enclose the brain, which is the heart or primary organ of the *superior* or celestial life of the machine,*—MAN.

be a curious and substantial means of preserving the remains and perpetuating the memory of an illustrious person or friend."

* "The brain has been examined by Vauquelin and John; and, in this difficult analysis, a surprising coincidence between their results may be observed. It is a curious fact, that in the brain of man no less than 80 per cent. of the weight is *water*. According to the analysis of Vauquelin, 100 parts of human brain consist of 80 parts of water; 4.53 of white fat; 0.7 of red fat; 1.12 of osmazome; 7 of albumen, 1.5 of phosphorus, united with the fats; 5.15 of sulphur, biphosphate of potash, phosphates of lime and magnesia, and other salts. Of such materials is the thinking organ of man composed. The spinal marrow and nerves are similarly constituted. The ratio of water in the brain of the calf is also 80 per cent." —*Cabinet Cyclopædia.*

The flower of every plant forms the primitive seed of animal life. The brain or flower of the animal fabric lays the foundation-stone for the succeeding species, or more perfect generation. Thus has the brain, like every animal, its three successive stages of existence, the oval, the fœtal, and the locomotive; these not being coexistant with the three lives of the inferior machine, but succeeding them in the following order:

Inferior machine.—	Oval.	Fœtal.	Locomotive.	
Superior machine.— . . .		Oval.	Fœtal.	Locomotive.

The ovum of the brain is produced by the change of the inferior machine to its fœtal state: the fœtus of the brain, commencing with the change of the machine to its locomotive state, is perfected only when the latter ceases to exist. When the fœtus of the inferior machine has attained a certain dimension, the brain commences its own organization by appropriating to itself the fluids hitherto received by the latter alone: depositing certain organs, it forms layer after layer of thick gelatinous muscle or scull, sufficient to protect its heart or primary, in coming into the world.* In the locomotive life of man, the human brain thinks,

* "The brain of a new-born infant weighs about ten ounces; that of an adult, generally three pounds and a half, apothecaries' weight, frequently a little less. But if the mind of an adult has been long devoted to thought, if he has been engaged in constant study, his brain is usually increased beyond this weight. The brain of Byron, for

feels, sees, and moves; it is therefore an animal body of a superior order in its second or fœtal stage of existence. It has light, heat, and motion, with every other property of matter in its fluid or active state. When the machine, or terrestrial Man, enters upon its new or locomotive existence, the brain and organs commence their active state of organization, which is carried on from that period, until what is called *death* takes place, when the superior fabric becomes perfected by the separation from its outward envelope or case, which last gravitates to the earth again, and forms eventually a rock or base, for the perfect or celestial man to move upon: the inferior life being intended for rearing the structure of the earth, the superior for man's own personal identity.

> "Shall we this moment gaze on God in man?
> The next, lose man for ever in the dust?"—*Young.*

Man has *two lives at the same time!!!* The one internal, the other external, the last being a mere machine or case for the protection of the former to its third or locomotive state of exist-

instance, is said to have weighed four pounds and a half, and that of the illustrious Cuvier four pounds thirteen ounces and a half. The size of this organ increases from the time of birth till manhood, remains stationary from this period until old age, and then diminishes in bulk and weight. The relative size of its different portions constantly varies during several of the first years of life, and it is not until about the *seventh* year that all its parts are formed."—*Brigham on Mental Cultivation.*

ence.* The animal thus protected being the sensorium, which, incased within the machine, grows with its growth, and finally attains its perfection, while the latter is gradually on the decline.†

* "The body is constantly undergoing change in all its parts. Probably no person at the age of twenty has one single particle in any part of his body which he had at ten; and still less does any portion of the body he was born with continue to exist in or with him. All that he before had has now entered into new combinations, forming parts of other men, or of animals, or of vegetable or mineral substances, exactly as the body he now has will afterwards be resolved into new combinations after his death. Yet the mind continues *one* and *the same*, 'without change or shadow of turning.' None of its parts can be resolved; for it is *one* and *single*, and it remains *unchanged* by the changes of the body."—*Lord Brougham.*

† "It is certain that the strength of the body, its agility, its patience of fatigue, indeed all its qualities, decline from thirty at the latest; and yet the mind is improving rapidly from thirty to fifty; suffers little or no decline before sixty; and therefore is better when the body is enfeebled, at the age of fifty-eight or fifty-nine, than it was in the acme of the corporeal faculties thirty years before. It is equally certain, that while the body is rapidly decaying, between sixty or sixty-three and seventy, the mind hardly suffers any loss of strength in the generality of men; that men continue to seventy-five or seventy-six in the possession of all their mental powers, while few can then boast of more than the remains of physical strength; and instances are not wanting of persons who, between eighty and ninety, or even older, when the body can hardly be said to live, possess every faculty of the mind unimpaired. We are authorized to conclude, from these facts, that unless some unusual or violent accident interferes, such as a serious illness or a fatal contusion, the ordinary course of life presents the mind and the body running courses widely different, and in great part of the time in opposite directions; and this affords strong proof, both that the mind is independent of the body, and that its destruction in the period of its entire vigour is contrary to the analogy of nature."—*Lord Brougham.*

The inferior machine grows downwards in the locomotive life of man, while the fœtus of the superior life is growing upwards. (See pages 198 and 272.)

The eye is the most perfect organ of the human body. The lens is composed of pure crystalline diamond* kept in a continual state of combustion by the rays of light constantly falling upon its surface in direct lines. By this means a fluid medium is thrown off, which falls into the cornea, and from the cornea the rays diverge into the optic nerve, by which they are conveyed to, and concentrated in, the sensorium, which is the true seat of light: the eye being but the telescope through which the light is conveyed by concentrated circles.† The eye, is at the centre, heart-shaped, but oval as a whole: when polished, it gives off light, is polarized, and becomes the perfect diamond: the upper part of every sphere being the source of heat, the lower of light. "Destroy the brain, and thought ceases; but this merely proves the necessity of the organ, and nothing more: the deprivation of the eye is the deprivation of visual faculty; but the eye is only the

* The celebrated Russian diamond is shaped like an eye.

The eyes of one of the Hindoo idols were said to have been made of diamond, and to follow the looker-on whichever way he went.

† The retina is the only part of the eye susceptible of light: from thence it passes on to the optic nerves; these *cross* each other.

instrument, not the percipient being."* Every animal, according to Dr. Grant, has one or more eyes, consequently must have a sensorium to see through these telescopes. The lungs connect us with the material world, the eyes and brain with the heavenly.

The human eye is a telescope through which man holds converse and daily intercourse with his Maker. It unites the whole living lens of the animal creation, and, when drawn out, reaches half-way between man and the Deity. It is the vast number of lenses the eye contains which give to the mind of man the idea of every external object being placed at a greater distance than it really is. Were it not for this optical delusion, we should be frightened at the close contact of bodies around us. "Why," asks Sir Charles Bell, "why is the eye made to turn upwards?" Why is it, but because it belongs to God not to man, being merely a telescope lent to him for his use and pleasure. Thus it is always straining, weeping, and looking up under every unkindness it meets with, to implore a safe passport to its parent home.

The eye of man is the knot that ties him fast to the body of his Maker. I have said that it is the

* "Lucretius maintained that the eye was not made for seeing, nor the ear for hearing."—*Whewell, B. Treatises.*

most perfect organ attached to the machine—Man;* in this one organ is displayed all the simplicity, beauty, and powerful mechanism of the universe.

The anatomist cannot possibly understand the mechanism of the eye without comparing it with the universe: he will then see that it is formed by the rejection from its centre of all matter unnecessary and hurtful to the organ, which, being thrown to the surface, gravitates by its own weight, and is consumed at the bottom or apex of the machine. From this contrivance, the celestial fœtus is constantly acquiring growth, power, and extensibility in its several organs.† This process is carried on until, by their continued increase in size and power, they extend beyond the prescribed limit, and are forced to contract, for want of further space, when they become united into one entire body.

The eye gives motion and life to the brain:

* "The eye is the most perfect of all the senses, and the least liable to imposition; it will embrace and transmit more knowledge in a single minute than a lecturer could dictate in an hour." —*Mr. Skey's First Lecture, Oct.* 10, *Lancet.*

† It was the opinion of Mr. Locke, that the understanding has not the least glimmering of any ideas which it does not receive from sensation or reflection.

Dr. Roget says, "the same mass of nervous substance which, under the name of brain, we have recognized as the organ of sensation, is also, as will afterwards be shewn, the organ of volition."

All things being material, even mind itself is nothing more nor less than substance acting upon substance.

through the medium of this organ impressions of external objects are transmitted to the sensorium. When the eye is at rest, the brain also rests from labour, and what is called sleep ensues. "Sleep is the *death* or *torpidity* of the organs of external sense, while the vital functions continue their accustomed actions; *death* is the sleep or *torpidity* of the whole. Every organ of the animal frame recovers from its fatigue or torpidity by rest, provided the principle of life, that is to say, the action of the vital organs, continues." Thus the poet says,

> "Come, gentle Sleep, attend thy votary's prayer,
> And, though Death's image, to my couch repair!
> How sweet, thus lifeless, yet with life to lie,
> Thus, without dying, O how sweet to die!"

Sunset and sunrise mark the night and day which the human brain is destined to enjoy: like those of our earth in its rotatory motion, these vary with the time of year in their division. If man, like other animals, were to rise with the sun and be satisfied to retire to rest at the hour of darkness, he would prolong his life: the eye would preserve its brilliancy and elasticity to a more extended period, and the brain would shoot out nerves much stronger in texture. Between the rising and the setting sun is the time appointed by nature for labour. Whatever is performed afterwards, must always be done imperfectly, and cannot fail to generate disease.

Man, during sleep, is in a horizontal position, and has the heat or flame of life rising from the blood upwards; consequently the fluids circulate but slowly through the vessels of his body, and will not deposit or excite the brain in any way, unless the blood itself be stimulated by unnatural aliment, when dreams, nightmare, &c. take place.

Imaginary feeling is an impression made upon the nerves and solid particles of the brain. The brain is itself an accumulation and condensation of the invisible fluids constantly rising up from the combustion of the blood through the ascending arteries. Real feeling is occasioned by the descending fluids, which all terminate in the uterus or generative organs. The mucous membrane is a continuation of the true skin, and conveys to the brain every internal impression, in the same manner that the outer skin does the external.

Compression of the brain is not caused, as is generally supposed, by too copious a circulation of the blood, but by air ascending into the cranium, and extending the bone or skull until the very sinuses are opened; if evaporation does not take place, in an equal proportion to the air absorbed in the cranium, compression of the brain is the consequence: an obstruction of the circulation between the arteries and veins succeeds, whence nervous irritation must necessarily ensue. The

brain may be compressed until its essence evaporates, and the charcoal only remains. The uterus of the perfect life is an elastic membrane or web, which is extended throughout every living particle of man. When the brain contracts the uterus expands, and the plastic diamond loses its elastic form. Thus man dies, and his machine is resolved into dust; but the triple elementary seed remains unchanged: mind, being the unity of parts of real substance, cannot be annihilated; for, whether animal matter be in the solid, fluid, or aeriform state, it is still the same, and will reproduce, in another state of existence, according to the degree of condensation exercised upon it.

Mind arises from the impression made upon the membrane or uterus by extending it: the extension is caused by heat, the contraction or condensation by cold. The impression may be compared to the watering of silk or calico; and when the elasticity of that membrane is lost, it shrinks up and becomes compressed into an imperceptible atom. All mental impressions sink deeper, and become more solid by age. This may be accounted for by the thickening of the membrane of life, both externally and internally.

The elastic web that incloses every particle of matter belonging to the machine—Man, is pure diamond in a solid state: each particle being

cemented together by diamond in its fluid state, in the same manner that bricks are cemented together by mortar and plaster, until the dwelling or machine is completely formed.* Death is the separation of these particles, owing to the dissolution of the elastic properties of the fluid which cemented them together; and as this fluid loses its elasticity or heat, will the mind of man or animal become collapsed, until death finally takes place, when every particle of these solid diamond atoms will gravitate to their receptacle, the uterus. The germ of all animal seed, being pure crystal, can never be dissolved away: but when decomposition of the living membrane takes place, by the principle of gravitation all and every particle composing this membrane is attracted by the veins, and through them falls to the uterus, the general reservoir for decomposed matter. (It is not unusual for the uterus, when its elastic power is gone, to beat and pulsate like the pendulum of a clock.) In this state, man retains his mind or intellectual faculties until the last moment of his existence.

* "The scarf-skin, which clothes all the rest of the body, gives way, at the extremities of the toes and fingers, to nails.

"All the great cavities of the body are inclosed by membranes, except the skull. The importance of the brain to life (which experience proves to be immediate,) and the extreme tenderness of its substance, make a solid case more necessary for it, than for any other part: and such a case the hardness of the skull supplies."—*Paley.*

Every child, born perfect, ought, if properly managed, to arrive at a certain stature: according to the size and stature of the parents that gave it life, that size may be predicted at its birth.

The material of which man is constituted is flexible, and every way capable of expansion: it is empowered to receive every noble feeling and expression, both in body and mind. Like the common tree in the field the machine shoots forth its branches from its heart or centre; and, according to the nourishment and air it receives, becomes enlarged or diminished in its growth. It differs, however, from the tree in its locomotive power. From this principle in man, we have a right to conclude, that change is necessary to the growth of both mind and body. As a proof of the truth of this observation, those children who are chained down, through circumstances, to one spot are stunted, stopped in their growth, and seldom arrive at their full stature. Should fortune produce a favorable change in their circumstances before the body arrives at that age when it ceases to grow, an alteration rapidly takes place, and the stunted shrivelled boy starts up into the graceful, full-formed man. It may be said that there are exceptions to this rule:—transplant the man of the north, robust in stature and every way vigorous, into our London atmosphere: we shall

find him live and forage his way through life better than our natives; but his progeny will become diseased, diminished in growth, and changed in character.* It is in vain then to plant healthy seed in a bad soil: the younger the plant, the more likely to be contaminated or destroyed. It would seem, however, that the original quality of the material given to man must be, by nature, told to account in whatever situation he may be in.

It should not be forgotten, that the life of the infant, or locomotive being, is totally different from that of the fœtus. When the fœtus enters upon its new existence, the heart begins to pulsate

* "A young lady, in the last stage of consumption, was restored to her health by the following extraordinary and accidental remedy:—She had long been attended by the faculty, but derived no benefit from their prescriptions; and considered herself verging to the end of her existence, when she retired during the summer to a vale in the country, with the intention to wait in solitude the hour of her approaching dissolution. While in that situation, it was her custom to rise as early as her malady would permit, and contemplate the beauties of nature and the wonderful works of God from her chamber window, from which she observed a dog belonging to the house, with scarcely any flesh on his bones, constantly go and lick the dew off a camomile bed in the garden; in doing which, the animal was noticed to alter in appearance, to recover strength, and, finally, to look plump and well. The singularity of the circumstance was impressed strongly on the lady's mind, and induced her to try what effect might be produced from following the dog's example. She accordingly procured the dew from the same bed of camomile, drank a small quantity each morning, and after continuing it some time experienced some relief: her appetite became regular, she found a return of spirits, and in the end was completely cured."—*Caledonian Mercury*.

and give motion to the nerves, by daily depositing fresh materials at the brain, causing it to shoot out fibres or tubes, which increase and lengthen as the child grows in years. If the muscles are allowed sufficient power to move (that is, good air and food,) in early life, the nervous tree will shoot forth fibres of vigorous growth, and the child will attain his perfect manhood.*

Man progresses from the ovum to the full-grown fœtus (which requires nine of our months to complete); from the fœtus to the adult: he should attain his full height at eighteen years after his birth: at double this period, thirty-six years, he should be at his greatest perfection: another eighteen will bring him to his fifty-fourth year, when he will pass his second equinox and enter on the winter of life: his age being to threescore years and ten, or twelve. Man may be said to have four periods (a spring and autumnal equinox, and a summer and winter solstice); the last termi-

* "In Little White Lion street, Long Acre, the inspectors of a District Visiting Society found, some months ago, a house, the internal area of which is only twelve feet by twenty-four, (not half that of the Cowthorpe oak, which is twenty-six feet in diameter,) containing nine small rooms, in which there dwelt, (i. e. eat, drank, and slept, and did all that poor mortality requires,) no less than eleven men, thirteen women, and sixty-nine children, making a total of ninety-three human beings, who have been crowded into less space than is enjoyed by a single tree, (Amænitates Querniæ.)—*Professor Burnett's Outlines of Botany*, *Vol.* i. p. 61.

nating his career in this world: each period, containing in number eighteen years ; he is growing and struggling to attain human perfection the first thirty-six, and the last he is gradually losing it and falling to decay.

> "How soon
> Our new-born light
> Attains to full-aged noon!
> And this, how soon to grey-haired night!
> We spring, we bud, we blossom, and we blast,
> Ere we can count our days—our days they flee so fast."
>
> *Quarles.*

When man has arrived at the summit of all knowledge, what does that knowledge teach him? to return back to simple nature, to retrace his steps, to become a child again in manner, to feed on simple diet, to be amused with being always in the air, to be sportive in the field, to be employed in the garden, to watch the rising and setting sun, the moon, and stars; in short, to admire and peruse the works of the Creator.*

* Mr. James, in his work, *The Gipsey*, says, "I quitted a life of sloth, effeminacy, and bondage, for one of ease, freedom, and activity. I left false forms, unnatural restraints, enfeebling habits,—ay! and sickness too, for the customs of my fathers, for man's native mode of life, for a continual existence in the bosom of beautiful nature, and for blessed health. We know no sickness but that which carries us to our grave; we feel no vapours, we know no nerves. Go, ask the multitude of doctors,—a curse which man's own luxurious habits have brought upon him,—go, ask your doctors, whether a gipsey be not to be envied, for his exemption from the plagues that punish other men's effeminate habits." And again, "I walk, hand in

The first seven years of man's life should be devoted entirely to sportive amusement in the open air; the next seven to graceful attitudes, such as riding, leaping, swimming, climbing mountains, games of ball, &c., and the healthful pursuits of botany, mineralogy, and entomology.

Nature intended woman not only to bring forth man, but to nourish and comfort him in his infancy, and to implant in his tender heart the first seeds of moral goodness: where do we see a man of distinguished character, but is indebted for it to his mother? Women, then, ought to be taught their real value and importance in society: surely nature never formed them merely to amuse man. "It is their province not only to form the body, but also to give the mind its most early bias—they have it very much in their power to make men healthy or valetudinary, useful in life, or the pests of society."

hand with the seasons, through the world. Winter, your enemy, is my friend and companion. Gladly do I see him come, with his white mantle, through the bare woods and over the brown hills. I watch the budding forth of spring, too, and her light airs and changing skies, as I would the sports of a beloved child. I hail the majestic summer, as if the God of my own land had come to visit our race, even here; and in the yellow autumn, too, with the rich fruit and the fading leaf, I have a comrade full of calmer thoughts. The sunrise, and the sunset, and the mid-day, to me are all eloquence. The storms the stream, the clouds, the wind, for me have each a voice. I talk with the bright stars as they wander through the deep sky, and I listen to the sun and moon, as they sing along their lonely pilgrimage. Is not this enough? What need I more than nature?"

Were the time that is generally spent by females in the acquisition of trifling accomplishments employed in learning how to bring up their children, how to dress them so as not to hurt, cramp, or confine their tender bodies, but in a manner best calculated to promote their growth and strength, mankind would derive the greatest benefit.

While the most enlightened men of the present day are studying how to cure disease, it should be the female's part to prevent it. Let woman emancipate herself from the errors contracted in her youth! Let her begin her education again! Let her become the companion of her infant children! Let her carefully watch their first feelings, nor any longer suffer them to become destroyed by being at so early an age placed under the care of hirelings. If what has been said by a very clever writer (Dr. Jorton) be true, that "what man is made during the first six years of life, he will continue the remainder of his life to be,"—if, I say, this be true—how amply would any mother be repaid for devoting these first six years to her offspring! I know it will be said that few mothers are capable of the task. I say, all are. All that survive childbed may become either less or more the protectors of their children. How many diseases might not be prevented by obeying the first law of nature!* Do we not find

* Why do we hear of so many diseases of the heart in the present day? Pray are not all the nobler feelings of the heart suppressed, nay, almost annihilated, by a false education?

in all the lower animals different constitutions, some stronger and some weaker, yet do we ever find them abandon their young?

Instinctive power is given to the machine for self-preservation, reason for the preservation of the whole race. Instinct will teach an individual what food to take and what to reject: it will teach him also to save his child from dangers and alarms during infancy; but it will not teach him to guard his offspring from the vices of society: hence the necessity for reason, without which man would soon become extinct.

If mothers were to imitate the lower races of animals in nursing their young, they would never lose sight of their infant offspring. The mother should accompany the nurse and child in all their walks: her eye should always be upon her babe: she would thus see it made comfortable in the nurse's arms, or when otherwise she would relieve its position by extending her mercy to the nurse: she would then see that her child was taken nowhere but to the park, garden, or fields, where she herself had directed. In this delightful attendance on her offspring, the mother would be gaining health for herself, and sweet wholesome nurturance for her young. Any woman may bring a child into the world, but to rear that child up in health, and make it a useful member of society, is not quite so easy a task. As that, however, must devolve on females

as a duty, such duty should be paramount: all desires, all pleasures should give way to this. No nursery should be distant from the mother's sitting-room: the nurse should be made the friend and companion of the parent; she should be made to feel a real interest for both mother and babe. The former should not forget that the nurse may one day become a mother herself, and that she is not only responsible to rear up her own child a fitting member of society, but also to render her nurse capable, in knowledge and judgment, to become in her turn a wife and mother.

Fathers have, or ought to have, an equal interest in the welfare of their children. "A gentleman of the first rank is not ashamed to give orders concerning his dogs and horses; why should he hesitate to perform the same good office for that being who derived its existence from himself, who is the heir of his fortunes, and the future hope of his country?" Education should be such as would contribute to dignify and strengthen the human character. Effeminacy will ever prove the ruin of any state where it prevails, and when its foundations are laid in infancy, they can never afterwards be wholly eradicated. That man, in the present day, is degenerating, must be quite evident, in spite of all the improvements in the medical department, and apparent progress of education. The prospe-

rity of England depending on the health and strength of its population, how to arrest the progress of this degeneracy should be the study of every thinking individual: and, the happiness of our offspring depending on the improvement of society, what more do we want to encourage us to undertake the task? Parents, who love their offspring and wish well to their country, ought, in the management of their children, to avoid everything that may have a tendency to make them weak or effeminate, and to take every method in their power to render their constitutions strong and hardy.

> "By arts like these
> Laconia nurs'd of old her hardy sons,
> And Rome's unconquered legions urged their way,
> Unhurt, through every toil, in every clime."

Nothing can more clearly illustrate the living action of man than a blacksmith's forge:* when, from his infancy, he is brought up in pure air,

* "The pulse in the time of Hippocrates was, probably, not more than 60 beats in a minute; from which, probably, originates our smallest division of time, denominated the moment or second, which divides the day into 86,400 parts. As the human species refine, probably the pulse quickens, and so completely are we machines, that, like a clock, the faster we go the sooner we are down."—*London Medical and Surgical Journal.*

"Were it possible to view through the skin the mechanism of our bodies, the sight would frighten us out of our wits. 'Durst we make a single movement,' asks a lively French writer, 'or stir a step from the place we were in, if we *saw* our blood circulating, the tendons pulling, the lungs blowing, the humours filtrating, and all the in-

little or comparatively no attention is necessary for him to grow up healthy and strong: supply him but with sufficient food (or fuel), and the lungs (or forge) will do the rest. The more suitable the diet is to the stomach, the less action for the lungs to perform, and vicè versa: again, the better and more pure the air he breathes, the less attention is necessary to the nature of his diet. Being well supplied with good atmospheric air, all will go on as it should do, and the infant will progress in health and strength to its perfect manhood.

Fever is a simple disease, and the only one with which human nature has to contend. There are but two causes, the one an excess of food,* the other too great a deficiency.† In either case, infection

comprehensible assemblage of fibres, tubes, pumps, valves, currents, pivots, which sustain an existence, at once so frail, and so presumptuous?'"—*Paley's Natural Theology.*

* "I tell honestly what I think is the cause of the complicated maladies of the human race; it is their gormandizing and stuffing, and stimulating those organs (the digestive) to excess, thereby producing nervous disorders and irritations. The state of their minds is another grand cause— the fidgeting and discontenting yourself about that which cannot be helped; passions of all kinds, malignant passions, and worldly cares, pressing upon the mind, disturb the cerebral action, and do a great deal of harm."—*Abernethy.*

"The elevation of shells is caused by too much nutrition in the animal."—*Dr. Roget.*

" It is remarkable to find cilia in the parts for digestion and respiration."—*Dr. Roget.*

† "Children are more frequently infested by worms than adults, because of their greater moisture; and those children, more than others,

or contagion must be the result, (the former being the latent, the latter the active state of the disordered machine.)* Fever varies in symptom from the lowest to the highest state of the thermometer, (or pulse,) according to existing causes, and the peculiar constitution or age of the patient. In all common and continued fevers, the circulation is increased; but, on the contrary, in the typhus fever it is impeded: hence, that dark hue to the skin; hence, purple spots and depression; hence, the effluvia from the body, that communicates the disease to others; in short, in the first instance, the body is in a state of infection, or fermentation; in the last, typhus, it is in a state of putrefaction and dissolution.†

When infection takes place by an introduction of bad air into the stomach of an individual, it stands to reason that the fluids must become changed: the noxious qualities must be separated from the pure matter intended to nourish the frame: air or steam

who are of a relaxed fibre, and in whose chylopoietic viscera digestion is ill performed."—*The Doctor Magazine.*

"The entozoa do not exist except the vital powers are weakened." —*Dr. Roget.*

* Infection implies the virus taken into the stomach by bad air, improper food, or drink: contagion, simple contact witn the diseased, or clothing of the diseased body.

† The lower the temperature of man, the greater the difficulty he has to withstand the currents of contagion always floating about in the atmosphere.

is the consequence, and man is swelled out in different parts of his body. The air or steam, becoming condensed, causes violent pains, twitches, and spasm, cramp, and every kind of contraction, even unto the pulse, which rises or expands just as the air in the body is heated or cooled; for fever is produced by too much or too little action of the heart, the primary organ: life and death are inseparable.

The first object of a physician should ever be to find out the true cause of the complaint; the second, to do that cause away; the third, to cure the effect of that cause.

In order to effect a cure for each class of diseases, the heart's action must first be consulted: to quiet, to soften, and compose this primary organ of the animal, must naturally assuage all the others.

I have said that the elastic membrane which surrounds every portion of the machine—Man, is composed of diamond, in its threefold state,—solid, fluid, and aeriform. (See page 452.) I will now proceed to describe the living action of this skin or tissue, confining myself to any one point or sphere of the surface.

All matter being diamond,* the primary egg in each sphere becomes by pressure divided into three

* "Some of the secondary acephalocysts are slightly milky or opaline; others are perfectly transparent, and capable of answering completely the purpose of a lens."—*Dr. Hodgkin.*

forms of matter, or eggs: the black crystal being at the bottom of the line, the red in the centre, and at the top the perfect white. The black, or lowest of these three,* is formed by matter falling down each side of the central egg, while in a liquid or combustible state.† The central egg, in the change, has acquired the form of a heart or hollow tube. The matter falling down the sides of this tube, by contact at the bottom, or apex, gives off the electric spark, by which means the hollow tube or heart in the centre is kept boiling and constantly throwing off fresh matter, depositing the perfect matter at the

* "The pigmentum nigrum is the cause of colour in the skin: the same material constitutes the black portion in the centre of the eye." —*Dr. Roget.*

† Electricity and combustion are identical. It is the great voltaic action, that separates the primary element into a binary or two-fold substance. It is the mixture of these two elements in their opposite states, that causes a corrodation and condensation of a third element, carbon.

"The diamond is pure carbon, or charcoal crystallized. It is among the rarest of all known substances, and carbon is among the most abundant. We can have a roomful of pure carbon for sixpence, but a bit of pure crystallized carbon, the size of half your thumb, is worth many thousand pounds. You drink diamonds when you drink soda water; but you drink them in the form of gas. Mr. Faraday has succeeded, by immense pressure, in reducing carbon from the gaseous to the liquid state; but it must be kept in a glass tube hermetically sealed. The moment it comes in contact with the atmosphere, it again assumes the gaseous form. Diamond requires great heat to burn it, but when it does burn, it consumes utterly. Its whole substance changes into that kind of gas which is pumped into soda water, and is produced naturally in champagne."

top of the sphere, and the gravitating or imperfect matter at the apex or bottom.* Thus it will be seen that the machine or primary egg is forming, at the same time, two sorts of matter or spheres: one at the top (the perfect one,) ejected by force from the bursting open of the machine or central cup, the other from the falling fluid to the bottom (the imperfect).

"With the germs of life, in all organized structures, will be found conjoined the seeds of decay and death."† Man is a complete manufactory of worms: every organ of his frame being built from them, and cemented together to form one grand whole.‡

* "A small species of parasitical animals has lately been discovered affecting the muscles of voluntary motion, amongst the fibres of which they have been found generally dispersed over the body. They consist of very minute cysts, of an oblong figure, in size and colour bearing considerable resemblance to the young of pediculi, attached to the hair of persons of dirty habits. When examined with a lens, these little cysts are seen, in many instances, not to be perfectly ovoid, but to be irregularly contracted towards one extremity, so as to form a sort of short imperfect neck. It is also not uncommon to find some opacity towards one or both of the extremities. They are placed in the directions of the fibres; and are lodged in the cellular membrane immediately investing the muscular fibrillæ, or the tendinous fibres to which they are attached. When the specimen is sufficiently recent, one and sometimes two thread-like worms may be discovered coiled up in each of the cysts."—*Lectures on the Morbid Anatomy of the Serous and Mucous Membranes, by Thomas Hodgkin, M.D.*

† "They (the cysts) occasionally appear to have been produced at different times, or to have advanced with greater degrees of rapidity. *By the united effect of the growth of these cysts*, the parent cyst is finally burst, and dies."—*Dr. Hodgkin.*

‡ "Our food is full of worms and their ova: it is supposed by

When, therefore, by any means, this cement is loosened by its elastic property becoming decomposed, the worms are set at liberty, and become themselves active living fœtuses;* gradually making their way to the surface of man's body, they raise in his skin tubercles of various forms and sizes, like unto the hillocks and mountains upon the earth's surface, and, like them also, they burst forth and form volcanic eruptions, emitting their lava, by the attraction of which new depositions are formed from the external atmosphere. Thus do the worms receive fresh growth by seed from without, while they are gradually withdrawing their sustenance from the internal man.† By the union of the

many that all *fluids*, even the blood itself, abound with their principia; some will have it, that it is from these worms, or ova taken in with our food, intestinal worms are produced; but how does this account for worms being found in the intestines of such very young children, and even fœtuses? Besides, the heat of the stomach and the gastric fluid would soon destroy any worms taken into the stomach, which *were not proper to the animal body;* add to this, that worms that are found in the intestines of animals, whether of mankind or of beasts, birds, or fishes, are unlike any that are found among vegetables, in earth, or in water."

* *The Vesicular Worms or Hydatids* "are not very rare in man—they infest all portions of his body, interfere with his existence, and have been found at all ages, even in the fœtus."—*Dr. Hodgkin.*

"The entozoa are found in the tissues as well as in the cavities of the body." —*Ibid.*

"The entozoa are not furnished with organs of locomotion."—*Dr. Roget.*

† "The young hydatids appear to be produced from different parts

internal fluid, and the seed from without, the worms become changed and developed into crawling beasts,

of the parent cyst; to which they are described, by authors, as being found attached, sometimes on the inside, and sometimes on the outside. For my own part, I have never known an acephalocyst to produce smaller ones, except from its internal surface; and to this I have not seen them attached, except when of almost microscopic size. Whilst scarcely a few hundredths of an inch in diameter, they may be seen in great numbers, perfectly detached, in the fluid of the parent; and neither then, nor when of larger size, have I been able to discover the least trace of neck, or other attachment, to the superior cyst. On the *inner surface of the latter* there are frequently seen numerous elevations, variously disposed, and differing both in form and magnitude, but generally minute. The opaque white spots affecting the hydatid membrane, are not confined to the internal surface: they are occasionally found upon the external surface. I have seen them half or two-thirds of an inch in diameter, of a circular figure, with an irregular surface, something like that of a cauliflower. * * * These inequalities have been supposed to depend on nascent hydatids; and the differences which they present have been assumed to be the characteristics of three species of acephalocysts. I am satisfied that many of these elevations are morbid growths from the parent cyst, and others of them possibly point out the spots whence the young have already been detached. I am not, however, prepared to affirm, that none of these elevations are attributable to nascent hydatids.

"In a case examined by Francis Sibson, jun., and myself, numerous transparent spherical granules were seen in the parietes of a parent hydatid acephalocyst; they were, in all probability, nascent young ones, and appeared to throw some light on the mode of production. They were situated much nearer to the internal than the external surface; and, although a few of them were of a larger size than some of the small, perfectly formed, detached hydatids, which, in other cases, I have seen within the interior of the parent, in this instance there were none which had become detached. I imagine that the separation or retention of these little bodies may, in some degree, depend upon the nature of the *internal* surface of the parent. If this internal surface be formed by an extremely thin membrane, or by a scarcely concrete substance, they may become detached almost as soon as formed;

poisonous and destructive to the health and happiness of the human race; and finally, by their reproduction, they destroy the atmosphere necessary to our very existence.* These animals, however, in their turn are destroyed, and from the decomposition of their bodies, the race of insects is generated.†

Every living particle of man being the fœtus of

but if the internal surface be composed of a firm membrane, or some tenacious substance, they may be retained, as in the instance last referred to, and even acquire the semblance of a peduncular connexion amongst themselves or with the parent cyst."—*Dr. Hodgkin, (copied from the Medico-Chirurgical Review.)*

* "An interesting, but not a very promising part of the enquiry into the history of acephalocysts, relates to the possibility of removing them. Nature does so in two ways: 1st, by forming a communication between the cyst containing the hydatids, and either the surface of the body, or the intestinal canal, or some other cavity, as, for example, the urinary passages, by which they may be evacuated. Or 2dly, the animal dies; its fluid is absorbed; and its membrane is folded and shut up, as an inert foreign body, within the outer cyst, which contracts upon it. The ossification of the cyst, thought by some to be a natural mode of effecting the death of the hydatid, is looked on by Dr. Hodgkin as a result of it, a more probable opinion." *Ibid.*

Of the Cysticercus, one of the classes of hydatids, Dr. Hodgkin observes, "The enclosing cyst, in which the cysticerci are lodged, whether derived from cellular membrane alone, or from a serous membrane in conjunction with the cellular, is generally thin; but when, in consequence of the death and contraction of the cysticercus, the enclosing cyst is allowed also to contract, it may acquire considerable thickness, and a dense structure. This is very conspicuous in the livers of sheep, in which the whole sac sometimes acquires a bony character. The *death and contraction of the cysticercus constitute the process by which a natural cure is effected.*"—*Ibid.*

† "The celebrated Italian physician Redi, who died in 1697, was the first to prove, by experiment, that insects are not engendered in putridity. To prove the fact, he had three snakes, which he called

some animal, and all these living animals, or worms, being united and strung together, when any one of them gains strength superior to the others, it

Angui d'Æsculapio, killed, and put into an open box. These were soon covered with small worms, all alike in shape, being conical, but of different sizes, as they were produced at different times, and which increased daily both in size and number. Having consumed the flesh, they all made their escape through fissures of the box, leaving the naked bones in a corner. He again had three of the snakes killed, and put into a box, as before; in a few days they were peopled with worms of the same shape as the former; but some, less than the rest, were inclined to flesh-colour, while the others were entirely white. Having devoured the snakes, they anxiously sought to escape, but as he had taken more care than before in securing all the outlets in the box, they were unable to effect this. Gradually, they became more quiet, and after some time, lay motionless, as if asleep. Shrinking into themselves, they imperceptibly took the form of an egg, and by the twentieth day they had all assumed this figure. At first they were of a white colour, but by slow degrees became golden, and then red. Some remained of this colour, but the rest continued to become darker and darker, till they were quite black; and, from soft and tender, their skins had changed to the brittle shell of the chrysalis or aurelia. On examining these more closely, he found the black ones were more strongly marked than the others, which were nearly smooth. At the end of eight days the red chrysalides burst, and from each issued a fly of a dull ash colour, 'turbid, dismayed, and, so to speak, wrinkled and unfinished,' with its wings yet unfolded; but in the space of a quarter of an hour it dilated its little body, unfolded its wings, and, relinquishing the sad ash colour, it was dressed in a vivid green, marvellously brilliant. It was now so much larger than before, that it seemed impossible to conceive that its little shell could have contained it.' In fourteen days some of the black ones burst, and produced a larger fly, 'black, marked with white, hairy on the abdomen, and red at the nether end; such as daily frequent butchers' shops, or any place where there is dead flesh.'

"So many different flies from the same kind of flesh did not dismay, but, on the contrary, stimulated him to fresh exertions; instead, therefore, of only one kind, he put many into different boxes, and

deranges the whole system of man, and finally must either be destroyed itself, or it will destroy him.* The animal, however, which dies of an eruptive or skin disease, will, in truth, not die, but become asphyxiated; life will only be suspended, and he will make his escape in another shape or form: witness the transformation of the silk-worm.

All eruptive diseases are foreign to the machine, or frame of man; they are the parasites developed by exotic matter. All those that lie concealed between the internal and external membranes belong to the blood, and are thrown to the extremities without penetrating the skin; for example, the measles, scarlatina, gout, rheumatism, erysipelas, &c.

obtained the same result as before, except that the different species of insects were more numerous.

"After this he made many more experiments on lion's flesh, tiger's, and in fact *multitudinous* species of fish, flesh, and fowl, cooked and raw, and found that the insects were promiscuously produced on all kinds of meat; and, indeed, one piece would sometimes contain all the species he had observed, and he generally observed not only worms but eggs. * * * He always found, that uncovered meats shortly teemed with life; while, on the contrary, those that had no communication with the external air corrupted, but never verminated."

* "Amongst a collection of hydatids, it is by no means uncommon to find some which appear to have lost their vitality, and to have become collapsed, more or less opaque, and of a yellowish colour. These parasitical animals are supposed to enjoy but a short period of life. The hydatids of pigs and sheep are said to be produced in spring, and to die the following winter. It is certain, however, that in man, either the continued life of individual hydatids, or a succession of generations, will protract, not merely the existence, but the growth of hydatid tumors to a much longer period."—*Dr. Hodgkin.*

are diseases of the blood. The lowest stratum of disease is that of the inner membrane, and is formed by the decomposition of the heart itself; the diseases of the blood, caused by the inferior organs, constituting the second stratum, while the third or parasitical is foreign to the body, and results from the two former.* In the early ages, man was strong, and took exercise enough to enable him to throw off all poisonous matter through the pores of the skin; hence the frequent occurrence of leprosies, plagues, boils, and blains, rarely met with in the present day.†

* "Of the *parasitic insects* it is requisite to speak. The most prominent are the various species of pediculi, or lice—the pediculus corporis—pediculus capitis—and pediculus pubis; the pulex irritans, or flea; the cimex lectuarius, or bug; the pulex penetrans, an American insect, which makes its way under the skin of the hands and feet, deposits its eggs there, and produces troublesome tumours; and several species of acarus, as the acarus scabiei, or itch insect."—*Dr. Hodgkin.*

"Other parasitical animals support a more distinct life, and have recourse to the animal which they infest only for their supply of food, and for the deposition of their eggs or larvæ. It is for a part only of their lives that they are imbedded in, or attached to, the animal, at whose expense they subsist. The greater number of these belong to the active class of insects; but a few, as, for example, the leech, are found amongst the annelides mollusca."—*Ibid.*

† "The leprosy was once so common a complaint, that in Europe alone there were between twenty and thirty thousand lazarettos, or plague-houses. In Dauphiny there was a plague-house for Nobles, and in Paris one for females of the blood Royal."

Is then civilization an antidote against pestilence? it is said to circumscribe its influence, and dry up its source. The plague does not prevail in a well-regulated country. It has not prevailed in China,

There are three classes of fever; the first class, or that of the ovum, was exhibited on the surface of the earth prior to the flood. The ovum of our planet was black, and its decomposition produced the lowest species of parasites. The decomposition of these has produced the second class of disease, or that of the fœtus, seen in the present races inhabiting the earth's surface; finally, their destruction will deposit the base of the future generation, (answering to the surface of man's body in his locomotive state.)

Organization commenced with the pure diamond, all being good and perfect up to a certain point, when the sphere of life was complete: but our first parents brought on the descending creation of disease and death by their disobedience. It was the malic, or apple acid,* the opposing principle to life, the juice of the verjuice crab, which was the first fruit of our own island: it was this apple and its juice that first produced disease,

although that country may be regarded as subject to it from the nature of its climate. It has not prevailed in France, Holland, or England, for more than a century; although in each of these countries it had once its seat.

* "The fruit of the various kinds of apple abound with an acid, called the malic, which is more or less predominant. The expressed juice of the unripe apples, especially of the wild crab, is exceedingly sour and austere; it is commonly known as verjuice."—*Professor Burnett's Botany.*

and marked with an indelible stain the future life of man. This mark is the mark of primary disease—the spot of the internal ferns or trees of the primeval forests,* never, never to be eradicated, until the great, the final change: when the coal or coke of the internal remains of this earth, and the green or half-charred wood on its surface, shall become ignited, and all be consumed, (as predicted by Scripture,) and again mashed up into one general substance, one carbonaceous mass of imperishable iron-stone, or ferruginous earth.

Man contains within his own frame the seed of every animal which has preceded him in the grand scale of creation; when his body becomes degenerated and separated into parts, or his whole machine destroyed, these elementary particles are set at liberty and awakened into active life, each particle producing a generation after its own particular kind. Man, indeed, is (and I feel assured the theory cannot be denied,) formed of a complete tissue of worms. From the very centre of the system unto

* The specimens of fern, taken from the coal-beds in the present day, are not, however, trees as generally supposed, but the remains of the once living moving inhabitants themselves: these very spots are the internal marks of the organic disease of that once gigantic race: the mere amphibious coating that concealed and preserved the internal man.

the surface, his whole body is nothing but a continuation of worms, all linked together to form one tree or rock, rising up perpendicularly to the earth's surface in the midst of the fluid atmosphere, which is given off, and daily increasing from his own body.

The outward skin of every animal encloses the whole race of its predecessors. While the skin is constantly undergoing change and forming a new deposit for a succeeding generation of a more perfect species, the single animal is itself endowed with the faculty of propagating and replenishing the world with its own particular kind. Thus hath every animal (man included) the two-fold mode of propagation, (analogous to the plant or vegetable, see pages 198-203;) one from its external membrane, the other from the internal ovum. By the first it constructs itself an independent tenement and sphere for locomotion; by the second, companions and associates for its youthful existence, and guides and protectors for old age and infirmities. Mechanism is an instinctive faculty of every animal, and progresses with its growth and necessities. Every animal seeks, by this ingenuity, to procure the primary object—its own safety. Thus doth it, by its mechanical instinct, contribute its own share towards perpetuating and improving human machinery. Instinct belongs to

the primary organ—the heart (or *inferior* machine,) design to the head (or *superior*.)

"After examining the nature of the principles of life, M. Cuvier establishes the general conclusion, that *no body exists which has not once formed part of a body similar to itself, from which it has been detached; or, that all bodies have shared the life of another body, before they themselves exercise vital motion;* and it is even by the effect of the vital force, to which they then belonged, that they have become sufficiently developed to support an isolated life. From this conclusion may be deduced the axiom, that 'life springs from life, and no other life exists than that which has been transmitted from one living body to another, in uninterrupted succession.'—'Being unable to go back to the first origin of living bodies, we have no resource,' say M. Cuvier, 'but to seek information of the true nature of the forces which animate them, in an examination of their composition; that is to say, of their substance, and the combination of elements which composes this substance or tissue. For although this tissue, and this combination, are, in some measure, the results of the action of the vital principles which gave them being, and continue to preserve them, it is evident that these principles can only have in them their source and their foundation. Thus, if the first assemblage of these mechanical

and chemical elements of a living body has been effected by the vital principle of the body from which it descends, we cannot but find in it a similar force, and the causes of this force, in order to exercise a similar action in favour of the body, which, in turn, descends from it. But, although our knowledge of the composition of living bodies is too imperfect to deduce clearly from it the effects they present to us, we may, at any rate, make use of that which we do know, in order to recognize these bodies even when inactive, and to distinguish their remains after death; for, in no unorganized bodies do we find fibrous or cellular tissue, or that multiplicity of volatile elements which forms the character of all organization, whether actually living or having lived. Thus, while inanimate solids are only composed of polyhedral particles, mutually attracted by the faces they present; while they only resolve themselves into a limited number of elementary substances; while they are only formed by a *combination of these substances, and an aggregation of these particles;* while they only *increase by the juxta-position of new particles,* which envelope the first mass by their layers; and while they are only destroyed by some mechanical or chemical agency, which alters their combinations; on the other hand, organized bodies, composed of a tissue of fibres and plates, the intervals of which are filled

with fluids, resolve themselves almost entirely into volatile substances, spring from bodies similar to themselves, from which they are only separated when they can act by their own strength, assimilate themselves incessantly with foreign substances, and, introducing these substances between their particles, increase by internal force, and at length perish by this internal force, by the effects even of their vital principle."*

I have shown, or endeavoured to show, what fever is ; and, in my opinion, fever is the only true disease, that one comprehending every other. Disease, or fever, is then the development of matter not analogous to the body of man, but corrupt and uncongenial to his nature, which weakens and destroys his vital powers, and finally brings his whole fabric to a premature decay. Having already stated, in a former part of this work, that disease and death are the result of disobedience to the laws of God; it behoves me in this place to endeavour to dive into and determine what these laws really are: we shall then see in what manner mankind are deviating from the true path.

Man is subject to, and governed by, seven laws, and these laws are universal and invariable: four of them are primary, as attraction, repulsion,

* Mrs. Lee's Life of Cuvier.

gravitation, and deposition; the other three secondary, viz. absorption, muscular motion, and locomotion.

The primary laws are simple, and belong to the matter itself, in its non-elastic state: the secondary are compound, and belong only to the machine, or elastic state of the materials.

Matter, in its solid state, has the simple power of attraction: in the fluid state, its power is doubled, it attracts and repels: in the aeriform state, its power is fourfold,—it attracts, repels, gravitates, and deposits.

The compound laws are acquired as follows: the egg has absorption; the fœtus, has (in addition to absorption) the power of muscular motion, and the full-formed animal is gifted with the most perfect power—locomotion.

Attraction is the first law of animal life, and belongs to matter in its latent or solid state. This law will be found, upon consideration, to be very different from that of gravitation. Bodies gravitate in exact proportion to their loss of power or heat, and always fall perpendicularly to their surface. Attraction acts horizontally, and two solid crystalline particles being pressed together by gravitation or any other foreign force, unite cohesively and become one living body. Thus did celestial matter originally become united into an ovum, (the first

condition of all organization,) by this law of attraction or unity which forms, as it were, a groundwork or basis for all subsequent power. From this may be drawn an inference respecting the Divine origin of matter, for attraction is synonymous with unity or love, the perfect attributes of the Creator: it was indeed a part of the heathen creed that God employed the principle of love, in the formation of the universe.*

The basis of matter or ovum being formed, we find a new law in action. Mr. Whewell, in the Bridgewater Treatises, enquires, "Who shall enunciate for us, and in terms of what notions, the general law of chemical composition and decomposition? Sometimes, indeed, we give the name of *attraction* to the affinity by which we suppose the particles of the various ingredients of bodies to be aggregated; but no one can point out any common feature between this and the attraction of which alone we know the exact effects. He who shall discover the true general law of the forces by which elements form compounds, will probably advance as far beyond Newton, as Newton went beyond Aristotle. But who shall say in what direction this vast flight shall be, and what new views it shall

* "The love of God is the perpetual knot, and link, or chain of the world, and the immoveable pillar of every part thereof, and the basis and foundation of the universal."—*Plato.*

open to us of the manner in which matter obeys the laws of the Creator?"

Absorption, which is only another form of attraction, viz. *aggregation,** is situated at the surface of the animal body, while attraction acts at its poles or gravitating line. At the poles, matter is of one kind only, and unites cohesively, increasing in force and strength upwards, according to the multiplied power of its particles, until a full stream of attraction is obtained, when it becomes perfectly radiant in power. At the surface, on the other hand, which is the elastic web or membrane, enclosing every atom of vitality, there are other laws in action, and repulsion being one of these, all matter, not analogous to the body, is repelled, all matter of the same form and quality absorbed. In this manner the machine, or animal, draws, by suction into its centre, all materials relating to itself and proper for its nourishment and increase in growth; the power of attracting its kind increasing with the increase of matter and organization.† Solid bodies or crystals attract crystals; fluids, fluids; and aeriform matter, the aeriform. Thus diamond attracts diamond; water, water; and carbon, carbon. Iron attracts

* "Aggregation is the attractive power of matter."—*Mr. Brande.*

† Majendie says that "all bodies, living and inert, imbibe;" and that "all the tissues of the animal economy enjoy this property of imbibition."

iron; gold, gold; and silver, silver.* Absorption is stronger in the fluid than in the solid state of matter: thus has water multiplied, and particle been added to particle, until it has increased to its present immensity and power. Aeriform matter attracts all bodies, of whatsoever form they may be. Animal and vegetable life have originated from, and are constantly preserved by, attraction. By this law, the human race congregate together. All persons of the same temperature attract each other. Instinct is nothing but attraction. In mankind, virtue attracts more powerfully than vice; in colours, white more powerfully than black. The celestial bodies increase in growth by this law, which belongs to every part of the universal membrane;† and from the influence of which may be said to result the harmony of the spheres, for it preserves all bodies in their proper places, and governs every motion of the vast fabric,—our universe.‡

* "In the old Peruvian mines, skeletons of Indians are said to have been found covered with fibres of silver, and the inward parts filled with lumps of the same metal. The original owners of these dry bones were supposed to have perished hundreds of years before; as their flesh decayed, silver had grown around them, till when found they looked like silver corpses."

† "The same law of mutual attraction, which we have before traced to the utmost bounds of the solar system, prevails also in spaces at a distance compared with which the orbit of Saturn shrinks into a point."—*Whewell.*

‡ In the Asiatic Researches, is the following passage of Sir William

Repulsion is acquired by matter upon entering into the fluid state of existence. With the com-

Jones. "I have had occasion to touch on the Indian metaphysics of *natural bodies*, according to the most celebrated of the *Asiatic* schools, from which the *Pythagoreans* are supposed to have borrowed many of their opinions; and, as we learn from *Cicero*, that the old sages of *Europe* had an idea of *centripetal force*, and a principle of *universal gravitation* (which they never indeed attempted to demonstrate), so I can venture to affirm, without meaning to pluck a leaf from the never-fading laurels of our immortal *Newton*, that the whole of his theology, and part of his philosophy, may be found in the *Védas*, and even in the works of the Susis. The *most subtile spirit*,—which he suspected to pervade natural bodies, and, lying concealed in them, to cause attraction and repulsion; the *emission, reflexion, and refraction of light; electricity, calefaction, sensation, and muscular motion*,—is described by the Hindoos as a *fifth element*, endued with those very powers; and the Védas abound with allusions to a *force universally attractive, which they chiefly ascribe to the sun*, thence called *Adytiya*, or the *Attractor;* a name designed by the mythologists to mean the child of the Goddess *Aditi;* but the most wonderful passage on the theory of attraction occurs in the charming allegorical poem of *Shirin* and *Ferhâd*, or the *Divine Spirit* and a *human soul disinterestedly pious:* a work which, from the first verse to the last, is a blaze of religious and poetical fire. The whole passage appears to me so curious, that I make no apology for giving you a faithful translation of it: 'There is a strong propensity which dances through every atom, and attracts the minutest particle to some particular object. Search this universe *from its base to its summit*, from fire to air, from water to earth, from all below the moon to all above the celestial spheres, and thou wilt not find a corpuscle destitute of that natural attractability; the very point of the first thread, in this apparently tangled skein, is no other than such a principle of attraction; and all principles beside are void of a real basis: from such a propensity arises every motion perceived in heavenly or terrestrial bodies: it is a disposition to be attracted, which taught hard steel to rush from its place and rivet itself on the magnet: it is the same disposition which impels the light straw to attach itself firmly to amber: it is this quality which gives every substance in nature a tendency towards another, and an inclination forcibly directed

mencement of repulsion, attraction, which hitherto had exercised an uncontrolled power, becomes condensed in its sphere of action, carrying on electricity with increased force, in a subordinate situation, viz. at the north pole or lower extremity of the atomic body.* Repulsion is a law exactly opposed in its effects to attraction. Attraction is ever striving to unite bodies: repulsion to set them at a distance. Repulsion is a rejection or putting away of all matter uncongenial to the attracting body: it is an effort of nature to preserve itself from an overplus or excess: attraction, by drawing into a new focus, withincertain prescribed compass or bounds, the rejected materials, turns them to account as living machinery. Thus are all the varied organs of animal bodies formed, in succession, by the union of these two forces.

Muscular motion is the second law of elasticity, and belongs especially to the fœtus. It consists of the expansion of the elastic web, in the act of

to a determinate point.' These notions are vague, indeed, and unsatisfactory; but permit me to ask, whether the last paragraph of *Newton's* incomparable work goes much farther? and whether any subsequent experiments have thrown light on a subject so abstruse and obscure?"

* "The attraction of cohesion or chemical attraction, in its most energetic state, is not liable to be destroyed by gravitation: this power only assists the agencies of other causes of degradation; attraction of whatever kind tends, as it were, to rest, a sort of eternal sleep in nature: the great antagonist power is heat."—*Sir Humphrey Davy.*

throwing off its fluid materials from the heart, by the southern or upper pole, and the consequent contraction and absorption of these materials at the northern or lower extremity. Of muscular motion and absorption in the fœtal state of matter, it may truly be said, that while the former is pushing, the latter is pulling: so that one continued stream of elastic matter is conveyed externally from the heart over the whole surface, until it is absorbed at the apex and returned inwardly in a new and purer form to the centre, to promote its combustion and support its growth.

Aeriform matter, in its non-elastic or disunited state, combines all the four primary laws, attraction, repulsion, gravitation, and deposition. The other three, absorption, muscular motion, and locomotion, it also possesses in its united or compound state, which is the elastic. Attraction and repulsion have been already described: I proceed to gravitation and deposition.

Gravitation is the loss of the vital principle, or change of matter, from an active to a latent state of existence. By this law, matter loses light, heat, and motion, and gradually attains a condition of perfect darkness, coldness, and rest; by this deviation from, or loss of, its primary qualities, matter is separated from its original position, the top of the sphere, and passes through every change in descending organi-

zation, from the perfect to the imperfect state, till it reaches the point or apex of that sphere, where, by the law of deposition, it is deposited to rest. The point of deposition is analogous to the point of attraction of a new sphere about to be formed from the matter which has been rejected from the last. The separation from perfect matter, at the summit of every sphere, always precedes a new formation at its apex; it is, in fact, the attraction for fresh matter at the apex, which causes the rejection from the superior part. This separation of particles is caused by their deviation from a straight line, by which they are compelled to unite at the opposite extreme, and reascend to the state of purity, whence they have been ejected.* Life is the ascent or progression of a straight line, ad infinitum, death the deviation from it. ("By sin came death.") Gravitation may be called the death, or descent of matter, from its most highly organized, to its least organized state, and attraction, the life or ascent of matter, from this last to the first or perfect condition. Between the two points, every gradation, in ascending or descending temperature, must be progressively passed through in the repeated

* In the Hectopadee, p. 270, "the ancient and celebrated composition of Veeshnu Sarma," is the following passage. "The dissolution of a body foretelleth a *new birth*; thus, the coming of death, which is not to be passed over, is as the entrance into life."—*Indian Antiquities.*

action and reaction upon the vital principle.* Thus,

"Organic forms with chemic changes strive,
Live but to die, and die but to revive;
Immortal matter braves the transient storm,
Mounts on the wreck unchanging but in form."

Dr. Darwin.

"Perpetual mutation appears to constitute the fundamental law of living nature; and it has been farther decreed by the power which gave the first impulse of animation to this organized fabric, that its movements and its powers shall be *limited* in their duration, and that, even when they are not destroyed by extraneous causes, after continuing for a certain period, they shall come to a close. *The law of Mortality, to which all the beings that have received the gift of Life are subjected, is a necessary consequence of the law of mutation.*"† Death is but a change to a more perfect state of

* "Every thing is produced from, and nourished by, every thing; by the recombination of the particles of one body, when decompounded, a second body is generated; from this second, a third; from this third, a fourth; and in the same manner to infinity. '*The corruption of one substance,*' observed Aristotle many ages ago, '*is the generation of another: and the generation of one substance is the corruption of another.*'"—*Mason Good.*

† Dr. Roget.

"We are in the habit sometimes of contrasting the transient destiny of man with the permanence of the forests, the mountains, the ocean, with the unwearied circuit of the sun.

"Not only the rocks and the mountains, but the sun and the moon have the sentence 'to end' stamped upon their foreheads. They enjoy

existence; it is the means by which matter undergoes purification. All animals contained within the universal fœtus, being subject to gravitation, must die; but when that fœtus enters upon its locomotive state, each part of its frame will have become purified and adapted to the new sphere. If then, it is by these slow degrees, and through a multitude of trials, man is destined to ascend to perfection, they should be regarded but as the stepping-stones to that ultimate goal, which will be the recompense of every intermediate sorrow and suffering. "Be ye perfect, even as your Father which is in Heaven is perfect!" and to those who remain "faithful unto death," will be reserved the "crown of life," as an eternal and imperishable portion. It is only by obedience to the laws of our Creator, that this future state is attainable in a moral sense, and, physically

no privilege beyond man, except a longer respite. The ephemeron perishes in an hour; man endures for his three score years and ten; an empire, a nation, numbers its centuries, it may be its thousands of years; the continents and islands which its dominion includes, have perhaps their date, as those which preceded them have had; and the very revolution of the sky, by which centuries are numbered, will at last languish and stand still.

"Perpetual change, perpetual progression, increase and diminution, appear to be the rules of the material world, and to prevail without exception.

"The smaller portions of matter which we have near us, and the larger, which appear as luminaries at a vast distance, different as they are in our mode of conceiving them, obey the same laws of motion; and these laws produce the same results."—*Mr. Whewell, Bridgewater Treatises.*

speaking, this obedience is enforced by gravitation. —It is written, "He shall rule the nations with a *rod of iron;*" and this rod of iron is the line of universal gravitation, by which all motion is effected. This most powerful law of matter was produced from the commencement of all organization in our universe. It was by gravitation that imperfect matter was first separated from perfection, in order that, by passing through the three successive periods of existence, it might become perfected as one pure celestial being. By separation or gravitation, matter was first divided into three forms, the solid, fluid, and aeriform, united in *one*, which finally became perfected, as the ovum of the universe: the materials of the ovum, by the same law, again gravitating to form a fœtus, threefold in one as before, and being again the separation of imperfect from perfect matter.

In fine, this law of gravitation is of the highest species of intellectual ingenuity, and descended from the perfection of mechanical genius; it existed prior to the creation of our universe, identified itself with the primary motion of matter therein, and is the quality of all organization. Well, then, might the poet exclaim,

> "Nature and Nature's laws lay hid in night,
> God said let Newton be—and all was light!"

"When he (Newton) had caught sight of the

law of universal gravitation, he traced it to its consequences with a rapidity, a dexterity, a beauty of mathematical reasoning, which no other person could; so that on this account, if there had been no other, the establishment of the general law was possible to him alone. He still stands at the head of mathematicians, as well as of philosophical discoverers. But it never appeared to him, as it may have appeared to some mathematicians, who have employed themselves on his discoveries, that the general law was an ultimate and sufficient principle; that the point to which he had hung his chain of deduction, was the *highest point in the universe.* Lagrange, a modern mathematician of transcendent genius, was in the habit of saying, in his aspirations after future fame, that Newton was fortunate in having had the system of the world for his problem, since its theory could be discovered once only. But Newton himself appears to have had no such persuasions, that the problem he had solved was unique and final; he laboured to reduce gravity to some *higher cause,* and the forces of other physical operations, to an analogy with those of gravity; and declared that all these were but steps in our advance towards a First Cause."* "It was the laws of motion," said Dr. Crombie, "and not the *causes,* which Newton professed to investigate. Of

* Mr. Whewell.

the origin of these laws, *how* matter, for example, gravitates, or *how* action and reaction are equal and contrary, he was professedly ignorant.* When he attempted conjecture he felt himself embarrassed." In Newton's first letter to Bentley, he indeed "allows that matter might form itself into *masses* by the force of attraction, and thus," says he "might the *sun and fixed stars* be formed, supposing the matter were of a *lucid* nature. But how the matter should *divide itself into two sorts*; and that part of it which is fit to compose a shining body should fall down into one mass, and make a *sun;* and the rest, which is fit to compose an opake body, should coalesce, not into one great body, like the shining matter, but into many little ones; or if the sun at first were an opake body like the planets, or the planets lucid bodies like the sun, how he alone should be changed into a shining body, while all they continue opake; or all they be changed into opake ones, while he continued unchanged; *I do not think explicable by mere natural causes,* but am forced to ascribe it to the counsel and contrivances of a *voluntary agent.*"†

Locomotion, the seventh law, is acquired by aeriform matter in its elastic state; gravitation belongs

* "Gravity is the tendency of matter to matter, and Newton developed its laws, but the *cause* eluded his search."—*Crombie.*

† Whewell.

to it in the non-elastic condition, and is the law of separation or death : locomotion is the reverse of this, and may be termed the law of perfect life ; for it is the highest power matter is capable of attaining in any sphere. Locomotion is produced by levity, gravitation by weight or density. The former always precedes the latter, for a body must ascend ere it can descend. Locomotion is produced by the purity of matter, gravitation by its impurity. All beings, as they become purified, rise in the scale of creation, and increase in their locomotive powers. This law is caused by the rejection from the system of all matter which, if retained, would deprive the locomotive animal of its buoyancy. A balloon rises in the atmosphere by throwing out ballast, and thus is made, by its levity, to rise above the ordinary confines of matter, and tower over the whole visible creation. Just so man, from the surface of his body exhales the matter which would be destructive to his elasticity, and keeps up his living locomotive powers. Locomotion always producing gravitation, and gravitation deposition: these laws must have preceded the formation of our universe ;* in the third stage of vitality must the Creator have himself existed when He willed the production of the celestial sphere, and

* "Plutarch and Stobæus say, that Thales first affirmed the soul to be αὐτοκινητον, a *self-moving nature*. Aristotle, that he calls it κινητικον, in respect to the motion it gives to other things, in which

imparted motion or life to the seed whence it has sprung. That the Deity does really exist exterior to all matter, producing and reproducing perfect beings, like unto himself, appears to me to be capable of clear demonstration. This universe has, indeed, been shewn to be a human fœtus; the sun, its heart and centre; the planets, the several organs produced from that centre; all together progressing to form one perfect being of a celestial order of creation—Man. This great end being accomplished, a unity, absorption, or coalition, will ensue, when the fœtus will emancipate itself from the universal womb, and the latter will remain the imperishable charcoal.

are included both parts of the definition of the Platonists, a *substance having within itself a power to move itself and other things;* which Plato argues to this effect: 'the *first of motions* is that whereby a thing moves *itself;* the *second,* that whereby it moves *another; every thing that moves itself lives;* every living thing lives, *because it moves itself;* therefore the power of self-motion is the essence of that substance which we call the soul, which soul is the cause of the *first generation and motion of things which are, were, and shall be;* and of all their contraries, as of all transmutation, the principle of motion, and therefore *more ancient than the body,* which it moves by a second motion.'"

Thus the *principle of locomotion* in the ovum of the universe was latent or inactive; in the fœtus it is *active,* but *involuntary;** in the locomotive or fully perfected being, it will become also locomotive, guided by the will alone.

* The heart "has nerves from the cardiac plexus, formed of branches from the par vagum and great intercostal; but these nerves are not under the influence of the mind, the *heart being a muscle of involuntary motion.*"—*Hooper's Vade Mecum.*

Matter, being all of animal origin, must, in the first instance, have been of one of the following characters—*living* or (what is commonly termed) *dead:* it certainly could not have possessed all those high qualifications it exhibits in the present day: its only inherent quality must have been that of friction, (else why the term *diamond cut diamond?*) In this primitive dry pulverulent state it must have been unpossessed of the cement or moisture necessary to connect and unite its several parts, like the building materials of a house, a ship, a man, or a horse, which may become mouldered to dust, and be again cemented to form other machinery or cases for different bodies. Friction or agitation, then, being the only inherent quality of matter, would cause heat, and heat moisture; consequently, the atoms would begin to adhere together. Two atoms adhering to each other would have double force: thus attraction beginning, the two would accumulate four, the four eight; and so on, until the mass assumed the solid form, and became the perfectly organized egg.*

Man errs in supposing that blind, or what is generally considered inorganic, matter cannot organize itself: that it has done so, may be proved

* "Whatever is composed of parts must have existed in parts before it became a whole."—*Dr. Crombie.*

by an empty room, common rain-water, and a variety of other ways. Life being the triumph of vital over physical laws, and progressive, organization must have commenced from the most simple, and been carried on to its present complicated, state. Its primary form being circular, (and it is well known that a circle may be enlarged from a mere point to infinity,) we must admit that matter has ever been and will ever continue to be. Power, extent or volume, and organization, have been acquired by unity and connexion. We have the same perfection in a single atom as in the whole universe: but who shall assert that one atom can possibly possess the power of millions? One single solitary atom could never be annihilated; but it could never, on the other hand, extend itself into space, or become voluminous, without some assisting power to extend it into a form, or condense it into one entire centre. This power is the innate principle of motion or life, which produced the law of gravitation, the original impression upon the matter forming our universe, of which all the subsequent combinations, &c., are the necessary result.

All the varied motions of matter are produced by contact. Organization is nothing more than parts uniting together to form a whole; as, in arithmetical progression, we find developed, 1. Unity. 2. Addition. 3. Subtraction. 4. Multiplication.

Such are the existing laws of nature. The beginning is the end, and the end the beginning.

Matter has been originally of such a quality, that organization was the necessary result:* it has existed from all eternity, and will continue to exist for ever. Animal life progresses from solidity to fluidity, from fluidity to the aeriform state, the compression of which produces elasticity, the most powerful form of matter. All matter composing machinery must be heated to a certain extent, to render it elastic.† When elastic, it becomes netted together, forming a web or case of animated matter, each particle or animal of the web being enclosed or sheathed in iron. By the elastic or aerial power, all matter is cemented into living machinery. The sun, moon, and heavenly bodies,—the earth, sea, skies,—the animal, vegetable, and mineral kingdoms,—are all chained together by one universal membrane of this elastic matter. Through the elastic fluid medium, or universal atmosphere, bodies of a denser quality may pass or repass without interruption. Light may traverse this vast universe,

* "The living principle is not the result of organization, but the *cause* of organization."—*Prout.*

† By the compression of this third form of matter, *locomotion* may be carried on to any extent. The powerful law of compression has commenced, and will continue until the whole of the materials of this universe are changed, and the fœtus acquires its third perfect and celestial stage of existence.

bending its course from world to world, and enlightening every hemisphere through which it passes. Without this elastic form of matter we could have no life. It is owing to the elasticity of the atmosphere, that planets revolve around planets, and systems into systems run. It is owing to elasticity that the world continues to increase and multiply its stores, to replenish and keep up the living system of animal and vegetable creation. It is by the power of elasticity that animal machinery is kept in a constant state of progression. Animal life is one continued piece of mechanism, and elasticity may most truly be called the *web of life*, for it encloses every atom or seed of vitality. But for elasticity, how could our stately vessels move upon the wide ocean? The proud waves themselves are stayed by elasticity. It is by this power that we have day and night, and that we and all the other inhabitants of this globe are blessed with heat and light.

The elasticity and non-elasticity of all bodies is occasioned by the *expansion and contraction of* MERCURY! It is this substance which gives motion or life to all bodies, and forms the vital principle of every species of organization. As it rises or falls in the scale of temperature, it gives life or produces death. This is the material employed in our common thermometer, to indicate the changes which

are taking place in surrounding objects; but *man himself is the faithful thermometer of life*, in which the living moving mercury rises or falls, to indicate the state of his health, or of the air which he breathes: teaching him what food to take, or, what to avoid, that his body may preserve its due balance, and move with a steady and orderly pace, according to its proper or natural internal and external temperature.* Who shall determine the ultimate consequence of neglecting to attend to the true thermometer of nature? It is the substance in question, Mercury, which is the elastic cement or boundary that confines particle to particle, in the same manner that common mortar confines the brick of any building, until the dwelling or machine be

* There is always a limit to elasticity. Steam will not rise higher than twelve atmospheres when the boiler bursts. Matter is then ejected and gravitates; in other words, loses its elasticity.

"All saliva forms a scum at the temperature of 212° at first, but ceases, or nearly ceases to do so, after it has boiled for some little time."—*British and Foreign Review.*

Salivation of a ship's crew by accident.—"One of the medical commissioners of the royal navy (Professor Burnett,) has given an account of the whole crew of a king's ship, amounting to two hundred persons, who were affected with salivation, to a high degree, by the bursting of some vessels containing quicksilver. Many lost their teeth, and two died. All the live stock, consisting of pigs, goats, sheep, cats, dogs, rats, and birds, were also put under its effects; even the decks of the ship were covered with a black powder. Several tons of quicksilver were scattered about the ship, which, from rolling about, became oxidized, and, it is supposed, affected the atmosphere."

completely formed. When man takes mercury into his stomach, the particles of his frame become loosened by electricity, and the elastic living cement is weakened or thinned of its due proportion. The machine, by this means, loses its equilibrium, and is separated or disunited into parts, until eventually the whole fabric is dissolved. Were man to stand upright after salivation, he would feel the balance-wheel of life turn round like a cork-screw, and gravitate to the centre of his abdomen; it would run down like the large weight of a clock when over-wound up.

Mercury is the only metal which unites the solid, the fluid, and the aeriform states of matter in one,—the elastic. In its condensed or contracted state, it forms the leaden bullet; when fluid, it is seen by us rising or falling in our thermometer: but its most expanded form may be said to be that of the universal medium or atmosphere. In the non-elastic state it descends from the white to the red, and thence to the black lead, which is always found at the bottom of the scale of life. All the elastic forms of the metal arise up from thence to the perfect quicksilver, or white (the top of the line), in regular ascending gradations. At that point in the thermometer—Man, mercury is ever in a boiling state, producing life and animation in all surrounding bodies.

There are three successive stages of elasticity, three co-existent ones of non-elasticity; the former being internal, the latter external to the machine, and each alike necessary to the preservation of the animal by which they are produced. These three stages are those of the oval, the fœtal, and the locomotive life. That such is the fact may readily be attested: I select the following instances of the kind in question.

"For the preservation of the immature seed, nature has used many ingenious methods: some are wrapped in down, as the seeds of the rose, bean, and cotton plant; others are suspended in a large air-vessel, as those of the bladder-sena, staphylæa, and pea."—*Dr. Darwin.*

"The buds of the horse-chesnut are coated with a viscid varnish, which is impenetrable to rain or dew. Most of the other species of winter buds are equally protected against evaporation from within, and moisture from without, by their dense shelly covering."—*Sir Anthony Carlisle, Philos. Magazine*, vol. xl., p. 41.

"The fly, when it commences laying the eggs, is usually found to deposit them in clusters. In most cases the eggs are left without any protection, *except that they are besmeared with a kind of varnish*, which is secreted and exuded at the time of depositing; in the *æstrus* this varnish is

applied to the purpose of making the eggs adhere to the hair of the animal on which the female places them.

"The method of *clothing* the eggs, as might be at first expected, differs in almost every kind of insect; but all rival each other in the ingenuity they display.

"An insect of the beetle kind covers and protects her eggs with a transparent membrane. One kind of fly, whose eggs are extremely brittle, provides for their protection in a manner which is truly astonishing. Its mouth is furnished with a kind of double saw, with which it makes a longitudinal incision in some leaves of a kind of fir, and having placed her eggs in it, in a single row from top to bottom, she stops it up with a green frothy fluid, mixed with the minute fragments of leaf detached by her saws. This composition, when dry, becomes quite hard, and affords the delicate eggs an excellent and ample protection. A species of moth envelopes her eggs in a frothy fluid, which, when it dries, becomes remarkably friable and hard, almost resembling *glass;* it is insoluble in water, and hence it is calculated to resist the weather for an unlimited period of time. Some kind of moths again surround their eggs with a kind of clothing, equally durable and impervious; it is composed of hair stripped from

their own bodies. In the article Entomology of the London Encyclopædia, this process is described in nearly the following words:—'With the material we have mentioned, namely, the hair, which they pluck off from their own bodies, they first form a soft couch on the surface of the leaf; they then place upon it successive layers of eggs, and surround and cover them with a similar downy coating; when the whole number is deposited, they cover the surface with a roof of hairs, which cannot be too much admired, for those used for the interior of the nest are placed without order, but those employed externally are arranged with as much art and skill as the tiles of a roof, and as effectually keep out the water, one layer resting partly on the next, and all having the same direction, so that the whole resembles a well-brushed piece of shaggy *cloth or fur*. When the mother has finished this labour, which often occupies twenty-four hours, and sometimes even twice that period, her body, which was before extremely hairy, is almost wholly naked; she has stripped herself, to supply clothing for her offspring, and having performed this last duty, she expires.'"

Of elasticity in its second or fœtal state, the silkworm affords a most interesting specimen. The following curious account is given by Mr.

Maurice, in the Indian Antiquities, of the manufacture of silk.

"The little animal, the bombyx, that produces this delicate thread, is scarcely less a wonder in the world of natural history, than its production formerly was in the commercial world. The body of the little insect, a species of phalæna, is composed of a great number of elastic annuli closely united or interwoven with one another, *and its heart, or rather a series of hearts connected together, extends the whole length of its body.* The beating of this *chain of hearts,* or rather, to speak more philosophically, the motion of systole and diastole, may be very distinctly perceived; and to observe the manner in which the vital fluid passes from one to the other, forms a very curious and interesting spectacle. They were doubtless intended to accelerate the circulation of the fluids through the body. In the cavities of the belly adjoining to the ventricle, the microscope discovers an infinite number of small vessels, forming a long bag or canal, in which is deposited the glutinous liquid whence the silk is formed, and these vessels communicating with a thousand winding meanders with the mouth, the little creature is enabled thereby to collect together and discharge, at pleasure, their contained fluids, which are hardened by the air into that delicate

sort of fibre of which the web or ball consists. This little ball is the last effort of the expiring insect, whose short period, at least in that state of existence, is a year; and it is fabricated at the expense of its being, as a worm; for, having formed its nidus, it becomes metamorphosed into an aurelia, and continues in that state, without any signs of life or motion, till in a few days, if not destroyed, as they generally are, to prevent the ball being injured, it becomes a butterfly, and makes its way out of the silken sepulchre, in which it lay as it were interred, into fields of æther. These balls, when taken from the mulberry tree from which they are suspended, are generally the size of a pigeon's egg, are of a yellow colour, and of an admirable construction, and are said to be composed of threads, spun out by the labour of the indefatigable architect, of many hundred yards in length:"—vol. i., p. 735.

In the fœtal or second stage of existence, as well as in the first or oval, there is, we find, a non-elastic case formed for the protection of the animal during its progress or change to a more perfect state. This web is produced at the expense of the life of the mechanic itself; for when that elasticity which was the stay or support of its internal fabric (its vital principle) becomes external to the machine, it causes the opposing or

gravitating principle (death) to ensue in the animal itself.

The human heart is the only perfect machine of the fœtal life: from this machine all others are constructed.* From the primitive egg of pure unadulterated diamond has been produced that delicate, most refined, and perfect living mechanic, the little silkworm. From this little worm, all heart, all love, all feeling, has been produced the immense and wonderful universe, with all its continuous chain or links of animated structure. From its own body has this little worm spun out the line which first formed the canopy of heaven, the silken bed on which its ashes would hereafter repose. It was this perfect little insect which produced from its tears the first pure crystal drop of water:† to its sympathy and love man

* The Indian rubber is the substance which most nearly approaches to that of the human heart. This has lately been discovered to be in some degree analagous to silk.

"Silk, which is the spittle‡ of a worm, has its good or bad qualities from the nourishment the worm receives from a good or bad leaf."

† This is always found in the human heart. (See *note*, p. 416 of this work.)

‡ The term spittle is improper. The glutinous fluid from which silk is produced is secreted in two canals, which run along the back of the worm, and after making sinuosities near the stomach, terminate at the mouth of an extremely slender duct, (or, according to some naturalist, by two ducts,) from which this peculiar fluid is discharged by the muscular efforts of the worm in the act of spinning."—*Philosophical Transactions.*

is himself indebted for an existence. It was this little worm which spun the threads forming the first matting and downy texture of his bed. From the mixture of its ashes has been wrought that entire web or continuous wrapper which encloses and protects every organ of his wonderful machine. (See note page 416.)

The skin of every animal is the non-elastic covering of the locomotive life. It varies from the softest and most silky texture to the most dense and brittle. The higher the state of organization, the more pure and perfect this outward covering or skin. Of all the specimens of this third state, that presented by the human race is the most perfect and wonderful; yet even this varies with locality and circumstances, from the black or tawny African to the delicate European. In the lower classes of creation the differences are still more strongly marked: witness the hippopotamus, the elephant, the various finny tribes and feathered races, the sloth, the beaver, and other animals which burrow in the bowels of the earth. What is then the cause of all these varied gradations? And how is the non-elasticity or skin of man connected with the subject of which I am now treating?

Locomotion, I have shewn to be effected by the rejection of all non-elastic matter from the

machine, or elastic portion. The former constitutes the descending, the latter the ascending creation. Thus, then, as man becomes purified and rises in strength and power, he rejects, from the surface of his body, a proportionate supply of non-elastic matter to form a lower creation. This rising again in the scale produces in turn all the inferior tribes: and thus we behold elasticity in every form and shape, until man, who has gradually stripped from his fabric its warm and downy covering for the production of rising generations, is eventually compelled to borrow from them artificial robes to supply his own necessities. Thus, from the fall of Adam, has Man, like the insect, been doomed to labour and die for the sake of perpetuating his race: it is he who appropriates to his own private uses all the visible creation, and repays the loan with the necessary interest.

It is in the third, locomotive life, that the sex becomes developed. Upon the surface of this earth, accordingly, we find animals divided into two sexes, male and female. But this creation is external, belonging to the inferior life or machine: it is the internal creation which forms the ascending or superior life of the fabric. The former is the non-elastic, the latter the elastic state. Elasticity unites the sexes, non-elasticity divides them. God must have united in His perfect frame both

sexes at that time when He said, "Let *us* make man in *our* image after *our* likeness, and let *them* have dominion, &c. (*Gen.* i., 26.) *So God created man in His own image,* in the image of God created He him, *male and female created He them.*"

The system of man presents to view two perfect frames, united by the spine, (the nerves of sensation and volition.) It is the office of the former to receive every impression in a passive manner: these may be termed the feminine nerves. By gradual progression through six distinct stages, these impressions are transmitted to the brain, and thence continued by six corresponding stages through the other half of the nervous system (the masculine) by the organs of volition, or active nerves. The nerves are, in fact, two perfect frames united in one: and it may here be mentioned that when Adam had been thrown into a deep sleep, Eve, the first woman of the external creation, was separated from his body. (*Gen.* ii., 21, 22.)

The substance of every animal is the same: its quality of three kinds, diamond, iron, and carbon: its genders, masculine, feminine, and neuter. The masculine gender is the iron, the feminine the diamond, the neuter the carbon or latent life.*

* Professor Sprengell, in his "*Institutes of Physiology,*" stated,

Man first existed in the neuter gender as in Eden, ere he was doomed to labour and death. Secondly, in the masculine as Adam, after Eve had been separated from his body: and lastly in the feminine gender, as *Eve.** In the non-elastic life, the genders are separated; in the elastic, united.† The perfect man is formed from one pure substance of a threefold nature, Adamus. He unites in himself the three forms of matter or genders in one—the elastic, the perfect solid, the perfect fluid, and the perfect aeriform. "For there are three that bear record in heaven, the Father, the

"that everything in the human body, is governed by *Polar influence*, and by the laws of *antagonisms;* that man is in a state of *positive electricity;* that his body is formed chiefly of oxygen; while the female body is in a state of *negative electricity*, with a superabundant quantity of *hydrogen* in the composition of its solids and fluids."

"In Dr. Darwin's Botanic Garden (vol. i. 395, in a note,) is the following account of the *vallisneria* as it has been observed in the river Rhone. They have roots at the bottom of the Rhone. The flowers of the *female plant* float on the surface of the water, and are furnished with an *elastic spiral stalk*, which extends or contracts as the water rises or falls; this rise or fall, from the torrents which flow into the river, often amounting to many feet in a few hours. The flowers of the *male plant* are produced under water; and as soon as the fecundating farina is mature, they separate themselves from the plant; rise to the surface, and are wafted by the air, or borne by the currents, to the female flowers."—*Paley's Natural Theology.*

* "The larva is the second state. * * * It has no sex, or at least none has hitherto been distinguished, the development of the sex of insects being confined to the state of imago or winged insect."

† "There is neither male nor female: for ye are all *one* in Christ Jesus."—*Gal.* iii. 28.

Word,* and the Holy Ghost: and these *three* are *one.* And there are *three* that bear witness in earth; the spirit, and the water, and the blood: and these *three* agree in *one,*" (1 *John,* v., 7.) In allusion to the Author of this universe, I shall not presume to apply either the masculine or feminine gender: but I do assert, without hesitation, that the celestial parent "in whom we live, and move, and have our being," unites both these genders in one perfect frame, the *elastic.*

There can be but one perfect man on the surface of every sphere: that one being always produced in ascent from the direct line upwards. Christ was the most perfect man of the present fœtal sphere, our earth: he united the nature of God with that of man in his own frame—the elastic with the non-elastic. He was the most perfect child born: the materials forming his inferior or terrestrial fabric, and those of his superior or celestial, being equally poized, his body and mind gradually grew up to maturity, perfect in height, in width, and temperament, without development of passion or feeling of resentment

* It is the second person in the Trinity (the *Word*) which corresponds to the fluid or active state of matter, by means of which God causes this universe to increase in size, and work onwards to its perfect or locomotive state of existence.

towards any human being. Thus constituted, and brought into the world at his regular and predestined period, his sole thirst was knowledge. From a child we find him attending to, watching, aud conversing with, all the wise men of the age in which he lived. Being so perfectly organized himself, his judgment, and comparison of objects, was most correct. His Almighty Father did not permit him to become degenerated: he suffered on the cross at the age of thirty-six years, in the prime of life.

Perfect man must always be the true God or monarch of his own individual sphere. It has already been seen that Adam was the perfect man of the terrestrial ovum, (page 233): he was the last being produced from the internal earth, and lord over the whole creation. That there was a succession of animals prior to the formation of Adam, is attested for us by the Scriptures. Adam was created in the image of God, and Eve afterwards formed from his body. Here then was the first instance of a separation in matter; and subsequently Adam and Eve, being rejected from the terrestrial paradise, became subject to death, (see pages 234-236.) The propagation by *separation* then commenced, by which the position of the garden of Eden may be identified with the interior of our earth, as gene-

ration by separation always belongs exclusively to the external portion, or membrane, of matter—the non-elastic state, (see page 246.) The descending creation, from Adam to Noah, occupied 2000 years: it must therefore have been 4000 from the origin of life in the ovum, at the time when the flood took place: for the ascent is equivalent to the descent in all things. From Noah, 2000 years more of ascending creation were completed at the birth of the perfect individual, Jesus Christ, (who, as in the instance of Adam, did not enter into life by the ordinary mode of propagation, being produced on the direct line upwards from the internal earth.) From the birth of Christ, 2000 years more have not yet expired: when these are accomplished, the world will have undergone another change, and entered upon its locomotive period of existence. The perfect man of the locomotive earth will be the future Jesus Christ, the risen Deity. It is the last perfect being of the internal sphere who is always the cause of the descending creation: who, in other words, may be said to unite the elastic to the non-elastic life, by forming, in his own person, the link of union. The imperfect generations (external) being those from Adam to Noah: the perfect (or internal) from Noah to Jesus Christ: the imperfect (external again)

from Jesus Christ to the future Noah;* by the preservation of whom will be eventually produced the perfect Deity of the locomotive life, in ascent from the direct line upwards.

Christ was, therefore, the second Adam. Adam was the lord of the primary earth, or egg: Christ that of the secondary earth, or fœtus. Adam was the liberator of the first creation—Christ that of the second: the persons are the same, the stages of life exhibiting them alone are different. Thus the minute man liberates the whole internal race, for the purpose of building up the entire machine by the deposition of himself and successors as seed for a new generation of an improved species. From Adam until the birth of Christ, the bulk of the earth augmented; but by the ascension of Christ to the perfect point of matter, (the moon, or brain,) caused by his rejection from the lower part of the sphere, (or earth,) a mutual oppression has commenced, and gravitation been the result to both. This gravitation will be continued

* "Other foundation can no man lay, than that is laid, which is Jesus Christ."—1 Cor. iii. 11.

"Ye are no more strangers and foreigners, but fellow-citizens with the saints, and of the household of God; and are built upon the foundation of the apostles and prophets, Jesus Christ himself being the chief corner-stone: in whom all the building, fitly framed together, groweth unto an holy temple in the Lord: in whom ye also are builded together for an habitation of God through the Spirit."—*Ephe.* ii. 19-22.

until the head or superior (the celestial) part of the sphere, becomes united to the body or inferior (the terrestrial.) At the former, enthroned in majesty, the ascended Deity awaits but his appointed time, when, the whole fœtal creation having been made perfect and gathered into his lunar sphere, Christ will descend and bring his saints with him, as foretold by the Scriptures. Then will commence the non-elasticity of the *locomotive* being, by which all the impure shall be separated from the pure, and the Saviour of man will govern the whole creation by His Almighty power.

All things being material, God must Himself be composed of material substance.* Man being created in the image of his Maker, justifies the supposition that the Author of Life is Himself a human being: in other words, *the perfect man*: His body,—composed of the purest diamond,† His

* "That something must have existed from eternity is self-evident; and what this something is, constitutes the question between the Theist and the Atheist. The one asserts the eternity of matter; the other that of an Intelligent First Cause, the Author of all existence." —*Dr. Crombie's Natural Theology.*

† "Dr. Smith says, that the word mostly used by the Celts for the Supreme Being, was Dia or Dhia, which, in the oblique case, has De and Dhe; that of this the Esus or Hesus, said to have been worshipped by the Druids, seems only to have been a corruption; and the Θεος and Deus of the Greeks and Latins were manifestly derived from it; that the Dhia or Dia of the Celts is the same as the Iah of the Hebrews."—*Higgins's Celtic Druids*, p. 198.

blood, of the clearest and most pellucid water: His organs alone being perfectly formed and arterialized,* His eye is the purest crystal, His ear the only correct drum,—it being extended by the perfectly elastic matter. He alone can hear all, see all, know all! He alone, of all beings, can breathe the pure oxygen—His whole body being formed from the spotless essence of all matter in the ascending scale. From the most minute atom this exalted being has risen and progressed in size and power, until He has attained His present state—all purity! all wisdom! all love! He must be the primitive fountain of all excellence, the source of all love; not love for Himself alone, but for the whole human race whom He has produced. He is the Author of all, and the Preserver of all. It is He who exists on the extreme confines of matter, to uphold, balance, and guide the amount

* Take, as examples of the human nature of the Deity, the following passages:

"The Lord liveth."—*Psalm* xviii., 46. "He walketh in the circuit of heaven."—*Job*, xxii., 14. "And God heard."—*Gen.* xxi., 17. "And God said."—*Gen.* i., 3. "And God saw."—*Gen.* i., 10. "His eyes behold, His *eyelids* try the children of men."—*Psalm* xi., 4. "His countenance."—*Psalm* xi., 7. "His ears."—*Psalm* xviii., 6. "Hand of God."—*Job*, xxvii., 11. "He rested on the seventh day from all His work which He had made."—*Gen.* ii., 2. "The Lord awaked as one out of sleep."—*Psalm* lxviii., 65. There are many others, which it is unnecessary to detail.

of the vast sum of human machinery. "Thus the knowledge and the agency of the Divine Being pervade every portion of the universe, producing all action and passion, all permanence and change. The laws of nature are the laws which He, in his wisdom, prescribes to His own acts; His universal presence is the necessary condition of any course of events, His universal agency the only origin of any efficient force."*

Having Himself passed through every gradation in ascending and descending organization,† the Supreme Being must have acquired in His own person, by the labour he has undergone, the experience and power, wisdom and goodness, which he virtually possesses:—His wisdom being the knowledge of Himself! Having arrived at the extreme boundary or verge of all organization, the summit of perfection in His sphere, He stands upright at the head of His own creation, all light! all perfectibility! The original sample of that moral and intellectual beauty, which Adam presented in the fair garden of Eden ere he descended from His perfect nature,

* Professor Whewell, Bridgewater Treatises.

† The Védantû philosophers teach that "God exists in millions of forms, from the ant to Bramha, the grandfather of the gods, as one moon is seen at once in twenty different pans of water."—*Ward's History, Literature, and Religion of the Hindoos.*

the Deity must, like our first parent, have been primarily called Adam,* or *Adamus*. Like him, the monarch of all He surveyed by land as well as sea, He presided in His own person at the surface of His individual sphere, (which sphere comprises all things visible and invisible.) But man, in the present state of creation, is only the most perfect animal or walking vegetable; the nervous fluid being the internal matter prepared and tempered sufficiently to extend and fill up the mould or machine for the ultimate perfection of the whole human race. The Deity, therefore, by having Himself attained the most perfect state, knows how, and by what means, He can regenerate and bring to perfection all the lower races of animals which have been produced from His own body. The sphere of the perfect man combines every other living animal; He unites them all in His own wondrous fabric. There are the animals internal, and the animals external: those internal are of the organic or elastic tribe, those which are external of the inorganic or non-elastic.

There are but two modes of propagation, as I have elsewhere stated: the one by the external

* "The name Adam may be traced to the Sanscreet root, *Adim*, or *the first*."—*Maurice's Indian Antiquities.*

Adam in Hebrew denotes "a man."—*See Pictorial Bible.*

membrane, the other by the internal ovum:* in the first case, it is by *many* eggs, in the last, by *one* only. By the former, man produces varieties of his kind, by the latter, his own peculiar species.

This universe, having originated in an ovum, must have been produced by one of the above methods: it must have been formed in the centre, or at the surface of a sphere: in either case, have issued directly from the body of the Creator.†

By the gradual dissolution or decomposition of His own body or fabric, the Perfect Man is producing a two-fold order of creation.‡ By the internal ovum (our universe) He is forming a human being after His own likeness, in whose frame will be united every living animal. This perfect being is His own son, Jesus Christ, the Saviour of man.

* See pages 198, 236-241, 340-346, 476.

† "The egg from which Osiris proceeded was the universe, but that universe itself had proceeded from Cneph. Cneph signified the Creator of the universe."—*Pictorial Bible*, vol. i. *Deut.* c. iv.

‡ "We know of no instance of the formation of animal matter but through the medium of an animal being. And, as no animal, by the hypothesis, existed, let the atheist explain to us the process, according to any chemical or mechanical law, by which animal matter was generated without the aid of animal substance. 'Brute matter,' says Voltaire, 'may be animalized. Milk, bread, and wine, may be converted into the substance of a man, having life, motion, and sensibility.' This is true; but to what purpose is the remark, as applied to the question of man's origin? Can this transmutation be effected, but by the medium of animal operations? Is not the previous existence of an animal necessary in order to produce the change?"—*Dr. Crombie.*

By the other or external mode of propagation (the surface) consisting of the matter which is always gravitating towards His apex, (the extreme point of descent in organization,) God is producing from the non-elastic materials rejected by Himself, a new foundation or base to *His own sphere*, (the sphere which he now moves upon, and which will hereafter become that of His son and successor.)

"Why, seeing times are not hidden from the Almighty, do they that know Him not see His days?" (*Job*, xxiv. 1.) Each stage of existence has its determined period; and the present Deity of man attained his summit of *fœtal* organization at a time which, in relation to the vast fabric over which He presides, corresponded with that year which gave terrestrial being to the Deity of our own sphere, Jesus Christ. Since then He has been gradually renouncing his existence: his organization has been on the decline: and it will continue to be so, until the arrival of an important period predicted by the Scriptures, when, from the dissolution of His immortal nature, shall have been perfected a new succession or race of animal creation in the subordinate scale of existence, but of an improved species. As the body of the Supreme Being becomes gradually decomposed,*

* I must here be understood to allude to the descending or non-elastic life of the Deity, not to His ascending or elastic nature.

this new generation is progressively arising internally from the base of His sphere; and when He has undergone an entire dissolution, and been wholly gathered into the internal fabric, a new base will be formed in progression beneath the last, from the body of the risen Deity,—His successor, (or Saviour of man,) who will then have attained the zenith of His organization. For this purpose it is that the Deity is undergoing death: the death of the imperfect, to bring all things to their perfect and pure state. The just for the unjust, God is crucified, by his own will, for the redemption of the human race.

Let not man then imagine that this minute speck of creation, Earth, is alone blessed with a universal Creator, Preserver, and Saviour. All the parts or portions of creation, visible and invisible, are God's: all are formed from Him by His own substance. He is all, and in all. Each minute sphere is but typical of the larger and larger ones to which it belongs. The whole celestial fœtus is but a part of the Deity; and each portion, internal as well as external, a representation of Himself. It was God who Himself rose to perfection in Adam, and then descended unto Noah: For what did He descend? But that He might also ascend? Thus Christ shone forth a revelation of the Deity. "God is not the God of the

dead, but the God of the living." (*Matt.* xxii., 32.) Therefore, did Christ ascend on high, to lead "captivity captive."* Each part is a portion of the living whole; and the terrestrial machine would be as incomplete without the patriarchs and their successors, as the universe without its organ, Earth. Man works on, and will work on, for ever: he is at once the creator, the preserver, and the destroyer. In him is contained the seeds of past, present, and future generations. He is the author of all, and will be the destroyer of all: the same man who produces is always destined to destroy his sphere for the preservation of himself and kindred.† "Thou, Lord, in the

* God "hath in these last days spoken unto us by His Son, whom he hath appointed heir of all things, by whom also he made the worlds; who, being the brightness of his glory, and the *express image of his person*, and upholding all things by the *word* of his power, when he had by himself purged our sins, sat down on the right hand of the Majesty on high."—*Heb.* i. 2, 3.

"Who is the image of the invisible God, the *firstborn* of every creature: for by Him were all things created, that are in heaven, and that are in earth, visible and invisible, whether they be thrones, or dominions, or principalities, or powers: all things were created by Him and for Him: and He is before all things, and by Him all things consist. And He is the head of the body, the church: who is the beginning, the firstborn from the dead; that in all things He might have the preeminence."—*Colos.* i. 15-18.

† "But some man will say, How are the dead raised up? and with what *body* do they come?

"Thou fool, that which thou sowest is not *quickened*, except it *die:*

"And that which thou sowest, thou sowest not that body that

beginning hast laid the foundations of the earth; and the heavens are the works of thine hands. They shall perish; but thou remainest: and they

shall be, but bare grain; it may chance of wheat, or of some other grain:

"But God giveth it a *body* as it hath pleased Him, and to every seed *His own body*.

"All flesh is not the same flesh: but there is *one kind* of flesh of *men*, *another* flesh of *beasts*, *another* of *fishes*, and *another* of *birds*.

"There are also *celestial* bodies, and bodies *terrestrial*; but the glory of the *celestial* is *one*, and the glory of the *terrestrial* is *another*.

"There is *one glory* of the sun, and *another glory* of the *moon*, and *another glory* of the *stars*: for one star differeth from another star in *glory*.

"So also is the resurrection of the *dead*. It is sown in *corruption*; it is raised in *incorruptiou*:

"It is sown in *dishonour*; it is *raised* in *glory*: It is *sown* in *weakness*; it is *raised* in *power*:

"It is sown a *natural body*; it is raised a *spiritual* BODY. There is a natural body and there is a spiritual body.

"And so it is written, The *first* man, Adam, was made a living soul: the *last* Adam was made a quickening spirit.

"Howbeit that was not first which is *spiritual*, but that which is *natural*; and afterward that which is spiritual.

"The first man is *of the earth, earthy*; the second man is *the Lord from heaven*.*

"As is the earthy, such are they also that are earthy: and as is the heavenly, such are they also that are heavenly.

"And as we have borne the image of the earthy, we shall also bear the image of the heavenly.

"Now this I say, brethren, that flesh and blood cannot inherit the kingdom of God; neither doth *corruption* inherit *incorruption*.

"Behold, I shew you a *mystery*; we shall not all SLEEP, but *we shall all be changed*,

"In a moment, in the *twinkling of an eye*, at the last trump: for

* (So that the first man of the new earth will be *Christ* himself.)

all shall wax old as doth a *garment,* and as a *vesture* shalt thou *fold them up,* and they shall be *changed;* but thou art the same, and thy years shall not fail."—*Heb.* i., 10-12.

Locomotive man always maintains the highest position in the sphere of life; in relation to *my* sphere, (for each man has a sphere of his own,) *such is then my own present position.* I therefore identify myself with the individual whose history has been given in the preceding pages. I am conscious of my existence in a sphere, each part or portion of which is more or less connected with myself. Between this elevated point in which I am developed, and the freezing point or apex of my sphere, all the parts or portions of myself must be ascending and descending. By the external membrane, I am even now falling towards the apex, by the internal line rising again in a new form towards my present locomotive position on the globe. All the intervening points are either my ancestors or successors in the scale. They all belong to me, and are necessary to my existence and reproduc-

the trumpet shall sound, and the dead shall be raised incorruptible, and *we shall be changed.*

"For this *corruptible* must put on *incorruption,* and this *mortal* must put on *immortality.*

"So when this corruptible shall have put on incorruption, and this mortal shall have put on immortality, then shall be brought to pass the saying that is written, *Death* is swallowed up in *Victory.*"—*Corinthians, Epistle* 1, xv., 35-54.

tion, inasmuch as I am necessary to that of a higher sphere than my own. Each successive being produced in this, my external sphere, marks the progression of its internal organization, and gradual ascension in the scale of life.

The history of man has never yet been geologically written. It has been truly said that no two stones are alike: an observation which applies very forcibly to the human race. Man's materials, size, qualities, and duration, are all dependent upon his specific gravity, or peculiar situation upon the earth of which he constitutes the crust. He may justly be styled "*a living stone:*" being employed by the one grand Architect in erecting a holy temple unto Himself.*

The most perfect man or Deity is He to whose sphere every other sphere belongs. He is always produced at the true poles of the surface at a defi-

* "Behold, I lay in Zion for a *foundation* a *stone*, a tried *stone*, a precious corner-stone, a sure foundation."—Isaiah, xxviii., 16.—(*See Daniel*, ii., 31, &c.)

Speaking of the tribe of Joseph, "From thence is the shepherd, the *stone of Israel.*"—*Gen.* xlix., 24.

"The stone which the builders refused is become the *head-stone* of the corner. This is the Lord's doing; it is marvellous in our eyes. This is the day which the Lord hath made; we will rejoice and be glad in it."—*Psalm* cxviii., 22-24.

"To whom coming, as unto a *living stone*, disallowed indeed of men, but chosen of God, and precious, ye also, as lively *stones*, are built up a spiritual house, an holy priesthood, to offer up spiritual sacrices, acceptable to God by Jesus Christ."—1 *Peter*, ii. 4, 5.

nite season, and his presence marks the ascending organization of the three periods,—oval, fœtal, and locomotive, in His sphere. (Of this we have instances in Adam and Jesus Christ.)* But there are gradations in perfection as well as imperfection: and internally as well as externally, between these definite points in time and space, are developed less perfect beings or branches, filling up the outlines of organization. Each intervening point, between the apex and top of the line, has two corresponding ones on the surface. As the ex-

* "A great man is a result, and not a cause; he is created, if we may so speak, by the spirit of the age which he embodies and represents. But on this subject we cannot do better than quote the words of Victor Cousin: 'A great man, whatever may be the kind of his greatness, whatever the epoch of the world in which he makes his appearance, comes to represent an idea, such an idea, and not any other idea, at the precise time when that idea is worth representing, and neither before it nor after it; consequently he appears when he ought to appear, and he disappears when nothing is left for him to do: he is born and he dies in due season. When nothing great is to be done, the existence of a great man is impossible. In fact, what is a great man? He is the representative of a power not his own; for all power merely individual is pitiful, and no man yields to another man: he yields only to the representative of a general power. When, therefore, no such general power exists, or when it exists no longer, when it fails or falls into decay, what strength can its representative possess? Hence also no human power can cause a great man to be born or die before his hour is come; it cannot be displayed; it can neither be advanced nor put back; for he existed only because he had his work to do, and he exists no more, only because nothing is left for him to do: and to wish to continue his existence would be to wish to continue a part which has been acted to the end and exhausted.'"—*Foreign Quarterly Review.*

ternal points descend in the scale, the internal one rises or ascends, till it finally attains the summit of all organization in its sphere—the brain, or moon. (See the diagram, page 274.) Upon examination it will be found that it is the twelfth sphere in which the machine or steam-vessel never fails to burst open, when the pure aerated invisible spirit—Man, escapes to another and loftier region, where he is united to his forefathers; while the terrestrial machine or body becomes prostrate for the propagation or production of his successors.

The life of man, therefore, depends not, as generally supposed, on the outward shell or skin, the earth's surface: but upon that internal line of ascent which is regulated by it. As the surface rises or falls, so does the internal line become accelerated or retarded in its progress.

Man is both a freeholder and a leaseholder: a freeholder by virtue of his celestial or elastic life, a leaseholder by the terrestrial or non-elastic: by the first he should ascend, by the last descend, ad infinitum. Whatever has lived once must live for ever. Each race of animals, having a sphere of its own to range in, should form to itself an upright and more perfect generation from the direct line upwards: thus the *celestial* man, or Deity, beginning at the bottom of the line, must gradually

be rising up to his native abode in the universe:* his relation to the sphere on which he moves is that of a parent to its offspring: one complete species or race is contained in that sphere, which is a successive identification of himself: from first to last, in either case, the succession or chain remains unbroken, and each link will eventually be recognised in its proper order. Hence we may discover the origin of filial love, ancestorial pride, patriotism, and religion:† for, from himself, man is led upwards to the contemplation of his Creator, by a continued chain of reasoning, drawn from internal and external evidence.

God being Himself the architect of this vast creation, we are His people and daily labourers, and must do the work according to His plan. Man, however, has unfortunately forgotten God and His commands, and thinks only of himself. By the increase of his mechanical power he has formed new plans quite contradictory and inferior to the mighty plan of God: thus is he fighting against his Maker,—his father, and only friend! an error which has been creeping on ever since the flood, and has now become one mighty vice:

* "Man is in no wise perfect, but a particle of perfection."
Chrysippus.

† All religions have emanated and progressed from one pure faith: all languages from one root.

so that there are two powerful opposing elements, (God and His children,) each acting from the strongest motives:* were it possible to separate them, all matter would become reduced to its primitive state, and this creation would be annihilated. God, however, has fought His own battles, and triumphed in His own person over the dark physical laws of matter. He has emancipated Himself from darkness, and arisen to a state of perfect light, seeing all things, knowing all things, and possessing power to enforce the execution of His supreme will. He is all wisdom, purity, and love! On the other hand, the minute man is so involved in error, that, but for the manifest love of Almighty God in making known His powerful laws at this moment, the whole race of human beings must inevitably be destroyed, and buried in a heap of ruins. Without a strenuous effort on the part of each individual, the whole universe would be plunged into one general scene of darkness and misery, by a *premature* destruction of this, our planet. To die, we know we must,—'tis but the change! but to die suddenly and prematurely, is to live again as imperfect beings; to witness and again

* Vice and virtue are the opposing qualities of animal life.

pass through all those scenes of guilt, strife, shame, and misery, we have already encountered in this present sphere, instead of entering at once into that celestial kingdom, which God is Himself struggling to prepare for our future abode.

Man is subject to primary and secondary laws: these laws are immutable. His existence, in common with the universe, is by the primary laws of attraction, repulsion, gravitation, and deposition: by them he undergoes decomposition or death, for they are simple, and belong to matter in its non-elastic state. By these laws the universal fœtus is completed in its structure, and made ready for its locomotive period. By the secondary, or elastic laws, absorption, muscular motion, and locomotion, man's peculiar identity is preserved, and his celestial being prepared for its future abode in the perfect individual. When, therefore, man is apprized of his identity with the Deity, and learns that obedience to the laws imposed upon him is necessary to the preservation of *both,* he will obtain a powerful incentive to conformity with the creation.

It is in man's own power to make the end of this sphere everlasting: he is at present struggling to annihilate himself. The human beings, de-

veloped at the surface of this our earth, with every other appendage of their external production, (animal, plant, and mineral,) constitute one entire mass or surface of descending creation. They are the parasitical races that live upon and derive their sustenance from the body which first produced them — they are the portions severally rejected from the internal mass and brought to the surface, there to support an isolated existence for a definite period, until, by progression through the several stages of descending organization, they are rendered fit to be received back again into the ascending or internal life of the planetary organ. There is a certain sphere assigned by nature to each part of the descending as well as ascending creation, which is dependant, as before stated, on the moral and physical qualities of the body in question; in other words, its temperature or specific gravity. Such being the case, it is quite evident, that man, in each stage of his existence, (the oval, the fœtal, or the locomotive,) must, if a pure and perfect being, present all his parts connected together in their due position.* For how can one sphere or organ

* "The great Creator of the universe has exercised in its construction the severest and most refined geometry, has traced with unerring precision the boundaries of all its parts, and has prescribed to each element and each power its respective sphere and limit."— *Dr. Roget.*

of the frame be misplaced or deranged without affecting the whole body? Each individual or particle, having a sphere of its own assigned by nature, must not only occupy that sphere, but conform to both its moral and physical conditions:* if otherwise, it must occasion contraction and deformity in the body which produced it: it must be a monster,—a weed,—a parasite,—an opposition to the laws of both God and man.

Death must be considered a law of nature, for it is the means by which matter is brought forward into a new state of existence, or organization: but *disease* is *premature* decay, or death,—a subversion of that law. Hence I must here be compelled to revert to an earlier portion of this present chapter, from which indeed a long, but necessary, digression has been made. Too much or too little food I have there shewn to be the causes of all disease:† and that fever arose from the development of matter uncongenial to the

* "In order to form a right judgment of the magnificent spectacle of nature, we must suffer every object to remain in its place, and remain ourselves in that which she has assigned to us."—*St. Pierre's Studies of Nature.*

† "Nature is imperative: she is arbitrary: her laws are invariable: she will sustain no interference, and listen to no compromise."—*Mr. Skey.* If any man or animal absorb more matter than his natural wants require, he will, either directly or indirectly, be called upon to refund.

machine—Man; matter which weakens and destroys his vital powers, and brings him to a premature decay. (See pages 463 and 479.) The machine gifted with locomotive life has definite conditions to fulfil; it is endowed with existence for a certain end, and has a term affixed for its duration, in order that it may accomplish that end. I have stated what this period should be, (see page 204); and the machine which fails of attaining its full growth falls short of the intention with which life was bestowed upon it:* add to this, it brings prematurely into existence the superior fabric—its celestial fœtus. In this case, instead of the natural equilibrium which should exist, the inferior laws are exercising stronger force than the superior, or celestial; and disease, to the community, or whole race contained within the sphere of the deceased person or persons, must result. For man

* "The measure of mortality of any population consists in the proportion of dying out of a given number living. As the still-born have never lived or respired, it is manifestly improper to include them among the deaths. Any person who is determined to include the 'still-born' among the deaths must, to preserve any consistency of principle, include in his number of living, all the unborn children between the sixth and ninth month from conception. Such a mode of proceeding is not to be thought of, when we have so well-marked a line as the act of respiration. In the Lancet of June 11, I stated the proportion of still-born in Glasgow, to be unusually high (1 to 16 births.) I have since met with an observation at Hamburgh for eight years, ending 1828, in which the proportion of still-born is of equal amount."

is but the highest link in each sphere, and all its component parts are governed or actuated by him:

"We make ourselves the path wherein we tread."

Life and death are the contending powers: organization is everywhere opposed to disorganization. The one unites, the other separates or divides: the *preponderance* of either is fatal to the whole frame. (See page 470-472.) If life be in excess, it is the product of disease; if death, on the other hand, of disease also. Thus are animals of every form and shape produced which are exceptions to ordinary nature! Monsters of a diseased creation, we find awakened into life such malformations as the Siamese twins,—the giants and dwarfs exhibited as curiosities to a vitiated populace,—animals with too many or too few members, enlarged or diminished organs, monster plants, and overgrown species of various races, which are too numerous to be dwelt on here, but are all comprised in the one large class of disease, —the disease, *fever,* before enlarged upon in the present chapter. (Pages 463-475: see also the notes.)

The more abundant these specimens of disordered organization,* the more necessary does it

* And we find them to be increasing in the present era.

become to devise some means of putting a stop to their ravages; for not only our present but future existence is at stake! Are then these unfortunate objects to be cut off and destroyed, like the offspring of the Spartans, to make room for the more perfect race? By no means: that would but aggravate the evil. It is not by eradicating the weeds which abound in every garden that the soil becomes purified: such efforts, like the result of cutting the hydra, add but to the power of the opposing principle of life: for it is by beheading the impure race, that so many of the present monstrosities have been produced: else why do we hear of horrors perpetrated daily, increasing in cruelty and barbarism? Why, indeed, but because the more man exerts himself to *destroy* the monster, *bred by decapitation,* the more powerful does it become: the end, indeed, cannot be attained by the means resorted to. If man would stop the progress of crime and disease, he must adopt another course: it is not by destroying the corrupt race, but by seeking to improve it, that the desired change will be wrought: it is life, not death, that is requisite to the preservation of the terrestrial fabric.* There are gradations in every sphere, and none without its parasites.

* Man, at once the creator and destroyer, crops the natural flower to wantonly adorn his buttoned mantle—to feast his eyes on its decaying beauty! Little does he think it is his own flesh and blood

The evil one, the monster in question, is a part of man's own sphere, a part of the terrestrial organ,

he is destroying with such wanton sport! Little does he think that not only in this apparently trivial instance, but in a thousand others, he is bringing premature destruction upon himself and his whole race!

Result of cutting down Forests.—" A. M. Devez de Chabroil, in a memoir treating of the effects arising from the extirpation of forests, cites several historical documents, all tending to establish the fact that the temperature of the country is not only lowered by the taking away of the trees, but that streams dry up, and rain ceases to fall. M. Boussingault confirms these by several instances where lakes have been diminished in consequence of cutting down the neighbouring woods, and the water restored to its former level by suffering the trees to grow again; also where the quantity of water has always remained the same, when the woods near it have been left untouched. M. Boussingault states, that in some of the provinces of South America, which are covered with wood, it rains every day; and in others, where the soil is sandy and arid, it never rains; yet these provinces have the same latitude and climate, and the projections and distances of mountains are nearly similar."

" An experiment is contemplated to be tried in America to produce artificial thunder, lightning, and rain, almost at pleasure. It is well known that vapour exists in much greater abundance near the earth's surface than higher up, and if this vapour could be elevated in ample quantities to a sufficient height, the superior cold would condense it into clouds, which, from the very process of evaporation and condensation, would be electrical. Hence may proceed those grand phenomena of nature. The method obviously pointed out is, to produce a powerful current from the surface upwards at the time the atmosphere is otherwise still, which may be accomplished by a great heat rarifying substrata. This is, indeed, the very step nature follows; and it was lately stated to us, before several gentlemen, by a distinguished philosopher, that it has actually been done, though accidentally, in America. A large quantity of wood or turf was by some means set on fire, and after burning a considerable time, a deep cloud formed above, and the phenomena of thunder, &c. followed. In corroboration of this it has been remarked that heavy rain, and not unfrequently thunder and lightning, follows great battles."

a part of the Universal Man, a part of the Deity himself! Let, then, the imperfect be made perfect, and adapted to the use of the whole race!

The one man comprises in himself all the other parts. Who will then oppress his neighbour, when he learns that that neighbour is necessary to his own existence, and that the evil will extend itself to the whole community, every branch of which is concerned in the preservation of the internal man,—the future earth,—the Deity, from whom he has descended? Man must henceforward look upon all things as connected with himself by one imperative link. He cannot advance—he cannot retreat—without influencing all those beings co-existent with himself, —who have gone before, or who will follow after him. These are as essential to his welfare as he is to theirs. Let him then become the mirror of moral and physical excellence! No more exactions from the poor! man must look to the oppressed at the commencement of his dawn of improvement; with them indeed begins the progress of disease which he has to arrest.* Let him feed the hungry,

* "The strikes of the cotton-spinners, which ended in the trials at Edinburgh and Glasgow, were, even by the confession of the men themselves, ill-timed. *The New Liberator* of Glasgow, a journal of the workmen, states, in an article of the 13th of January, 1838, that trade being prosperous in the latter end of 1836, 'the spinners memorialized their employers for an augmentation of wages, and the

clothe the naked, comfort the afflicted, and heal the diseased :—let him act a Saviour's part to his

rationality of their claim being so self-evident, they succeeded with little difficulty, and without exercising any coercive measures whatever. * * Thus everything went on harmoniously between the operative spinner and his master until the spring of 1837; but by that time the frightful and every way alarming stagnation of trade had set in, the manufacturer had little demand for the productions of the loom, and the weavers were thrown idle in thousands. In consequence of this melancholy reaction in our commercial affairs the prices of yarns began to decline; and the masters' first step, on being offered lower prices, was to reduce the spinners to the standard which existed *prior to the recent advance.* This step was promptly and decidedly opposed by the operatives, who struck work in April, 1837.' And what was the result? It lasted seventeen weeks and five days, and terminated by the spinners unanimously agreeing to return to their work within three days after the ruling committee had been arrested in a body. The loss to Glasgow during the strike is estimated at £194,540. But the sufferings of the working people were dreadful. 'The aliment allowed by the association to each man, during the latter part of the strike, was only *eighteen-pence* a week. From thirty-five shillings a week to one and sixpence is a serious fall. But the condition of the female operatives,—the piecers, carders, and reelers,—was infinitely worse, for there was no fund whatever provided for their maintenance, and from the commencement they were thrown upon the streets, without either asylum, employment, or subsistence. It may readily be conceived what must have been the consequence of six or seven thousand women being kept in a state of destitution and idleness for four months; especially when in close proximity to equal numbers of the other sex, also trained to disorderly habits by the habitual receipt of high wages and frequent intemperance. *The necessary consequence was, that crime and immorality increased to a frightful degree; and the rapid progress of* FEVER, *as well as great increase in the rate of mortality*, evinced, in an appalling manner, how fatal such strikes are to the great interests of the labouring poor!'

"From a table compiled with great care from the *Vital Statistics of Glasgow*, lately published by Dr. Cowan, it appears that, in 1822, the population of Glasgow was 151,440; the total number of pri-

fellow-creatures! in protecting them he is but succouring and prolonging his own existence, by the preservation of that great body of which we are all alike constituted members. Man has received the gift — Life, and is accountable for the use which he makes of it: he must live for ever, — but it depends on himself alone, whether he occupies an exalted or debased position in the scale of creation. It has been justly said, that *"the consequences of our actions never die;"* for the impression of vice, like that of virtue, is permanent in every sphere. On man himself does it depend, whether the now-progressing celestial Being shall attain His perfect dimensions, or enter into life in a deformed and mutilated condition.

soners tried, 98; the fever patients in the Royal Infirmary, 229; the total deaths, 3,690; the rate of mortality 7 to 41. In 1837, the population was 253,000; the prisoners tried, 392; the fever patients in the Royal Infirmary, 3,860; the total deaths, 10,888; the rate of mortality, 1 to 24. These are changes with a vengeance. Fever has increased 1,600 per cent.; deaths 300 per cent. The situation and climate of Glasgow have not changed. All this is the work of trades' unions."—*Morning Chronicle*, April 18, 1838.

All congregative powers afford an instance of the congestive state of fever, being produced by the blocking up or congealing of the circulating fluid medium. It is by hoarding and accumulating wealth to himself, that man produces disease and death in the community at large, through withdrawing its appropriate nutriment. The internal superabundance always denotes the external deficiency, and *vice versâ.* The individual must never be aggrandized at the expense of his whole sphere. Man lives on the labours of his species, and is bound to return, morally and physically, the obligation.

The rapid progress of fever and other events intimating the *premature* approach of the period fixed for the entrance of the celestial fœtus into his third or locomotive stage, not a moment should be lost in endeavouring to avert the impending danger. Prompt and forcible measures must instantly be adopted! and, in the present critical position in which the life of man is placed, to whom should we have recourse for assistance, if not to the medical branches of the community? The physician of the individual must now become converted into one for the whole race: he must know, that what may be administered to one member cannot be hurtful to the many, for

"All are but parts of one stupendous whole!"

Physiological knowledge should now be applied, not only on the minute, but on the most extensive scale: otherwise disease and death will ensue to the whole human race. From the physiologist it is that we must ascertain the true and healthy state which the fabric of the universe should present in its several stages; it is he who must inform us which parts are healthy or diseased—what symptoms are likely to prove favorable, or what fatal, to its structure—the mode in which the superabundance of growth of its popula-

tion * is to be retarded, or the deficiency supplied, for the preservation of the necessary equilibrium among the several organs. If any part or member has extended beyond its due limits and encroached upon the territories of another, he it is who must prescribe a new and a safer channel, that the temperature may be reduced to its proper standard, and the fever become subdued. In the universal constitution, each man (whether the miner, the tanner, or the forger,) must have an allotted station; nor can he depart from it without an injury to the whole sphere. By restoring each organ to its true position, and appropriating each part or member of that organ to its destined function, we shall be enabled to compose and harmonize the whole system of Man. However humble his position, each individual must now become of essential importance to the general welfare. Away, then, with every imaginary distinction of birth, of employment, or of country! we all are of one family—descended from one parent; our common country—the whole habitable globe; our employment—the one end and aim of perpetuating and improving the human species! Medical information must be extended without reserve to every branch of the community, in order that each individual, by the preservation of his own health, may contribute his share towards purifying the

* See page 467-472.

atmosphere, one portion of which, by becoming corrupt, has spread taint and infection over the whole earth.

God has commanded that a *perfect* man be produced: "Be ye therefore perfect, even as your Father which is in heaven is perfect!"* man himself must pay the penalty if it is otherwise. Each individual, having a character of his own to sustain, has had implanted in his heart every law necessary to regulate and guide him throughout life: it is only when he deviates from those laws that he loses the rudder which balances his course, and falls from his position in society. Man's first endeavour should be

* Matthew, v., 48.

"Unto every one of us is given grace according to the measure of the gift of Christ. Wherefore he saith, When he ascended up on high, he led captivity captive, and gave gifts unto men. (Now that he ascended, what is it but that he also descended first into the lower parts of the earth? He that descended is the same also that ascended up far above all heavens, that he might fill all things.) And he gave some apostles; and some, prophets; and some, evangelists; and some, pastors and teachers; for the perfecting of the saints, for the work of the ministry, for the edifying of the body of Christ: till we all come in the unity of the faith, and of the knowledge of the Son of God, unto a *perfect man*, unto the measure of the stature of the fulness of Christ: that we henceforth be no more children, tossed to and fro, and carried about with every wind of doctrine, by the sleight of men, and cunning craftiness, whereby they lie in wait to deceive; but speaking the truth in love, may grow up into him in all things, which is the *head*, even Christ; *from whom* the whole body fitly joined together and compacted *by that which every joint supplieth*, according to the *effectual working in the measure of every part*, *maketh increase* of the body unto the edifying of itself in love."—*Ephesians*, iv., 7-16.

to discover his true position upon the earth which produced him, and if it be not that which he now occupies, physically or morally, let him endeavour to regain it: for, if he loses his own sphere in the universal fœtus, he will be degraded or degenerated in the *locomotive man,* and finally, becoming non-elastic, will be rejected and thrown off from the fabric of his Deity, to descend to the very lowest sphere or apex of all organization: nor will he recover that which ought to have been his true position until he has passed through every intervening degree in the ascending scale of life.

No more, then, let man battle with his fellow-man—it is with the elements of nature that he has now to contend! they are fearful, they have become dangerous and destructive to his existence:*

* "Between the years 1314 and 1317, the city, in common with the rest of the kingdom, suffered greatly from a scarcity of provisions, which eventually produced a complete famine, although different ordinances were made by the parliament to limit the consumption, and restrain the prices of corn, meat, poultry, &c. 'There followed this famine,' says Stowe, 'a grievous mortality of people, so that the quick might scarcely bury the dead. The beasts and cattle also, by the corrupt grass whereof they fed, died; whereby it came to pass, that the eating of flesh was suspected by all men, for flesh of beasts not corrupted was hard to find; horse-flesh was counted a great delicacy; the poor stole fat dogs to eat; some, as it was said, compelled through famine, in hid places, did eat the flesh of their own children, and some stole others, which they devoured. Thieves that were in prison did pluck in pieces those that were newly brought

man must therefore learn to subdue himself, as it is from his own body that these elements have been produced, and by the multiplied power he is daily giving to them that he is now about to put a *premature* period to his existence. These very elements by condensing around us are forming immense rocks and strata—a stumbling-block and a hinderance to the descent of our Deity; in the midst of huge mountains of ice the existence of the Son of God is suspended. Ye then, who would pre-eminently distinguish yourselves in the approaching glorious era, be prepared to enter into a new species of warfare! To the Holy Wars—to the liberation of your imprisoned Deity—sally forth! Man your ships, ye brave mariners! make ready to set sail to the east—to the west—to the north—to the south! A discovery more brilliant than that of Columbus awaits you! a new, an unexplored region is about to be revealed—a country already the abode of your fathers, your mothers, your sisters, your lovers, and your friends! Weep no more for them the tears of unavailing regret!— they yet live — they await but their appointed time to be re-united unto you! Let not the glorious plan of your Creator

among them, and greedily devoured them half alive.' *This famine is said to have been brought on by a continuance of wet weather.*"

be counteracted! — for with yourselves remains the great task of accomplishing the restoration and redemption of your race!

Man has but to apply himself to the study of the various springs arising from his own heart, and the way in which they are reverberated back again by the multiplied bodies surrounding him: he will then see that eternal life is not a delusion, but that the human mind is composed of materials capable of unity, compression, and expansion; that the brain is truly the table, type, and perpetual record of all human actions in this sphere: that it enables him to mount with his mind's eye up to the skies, to dive down to the fathomless deep, to converse with his Deity, to see the strength and power of His laws,—to admire the beautiful structure of the heavens, and to know that he himself has been formed of the same materials and shaped by the same mould, and that by strict adherence to those laws he will find declining life bring with it that mental perfection which will enable him not only to see past events, but to view with calm resignation all the scenes of the present life, under the conviction that they are necessary before he can arrive at that perfection which is requisite to ensure his everlasting dominion, glory, and happiness. That man will attain a future state of perfectibility, and

consequently of happiness, may be known by common-place observations made upon bodies surrounding him. Life is a problem, wanting only labour to solve it! The astronomer must go hand in hand with the mechanic, the physician with the mathematician, when they will be able to gain one standard of measure: heat, light, width, depth, quantity, quality, points, lines, solids, and superficies, all, all, will be explained!

INDEX.

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